PROCEEDINGS OF THE LOW VISION CONFERENCE

VISUAL ABILITIES-THEIR BEHAVIORAL ASSESSMENT AND POSSIBLE METHODS FOR THEIR IMPROVEMENT IN THE INDIVIDUAL WITH SEVERE VISUAL IMPAIRMENT

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VISUAL ABILITIES - THEIR BEHAVIORAL ASSESSMENT AND POSSIBLE METHODS FOR THEIR IMPROVEMENT IN THE INDIVIDUAL WITH SEVERE VISUAL IMPAIRMENT

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PREFACE

Conferences can often be a drag. The ones which are most enjoyable always seem to have involved small group interaction. The amount of learning and change of point of view which participants feel takes place is almost directly proportional to the amount of time they have been allowed to talk. These proceedings are an attempt to record and furnish supplements to such a conference. During 1970, there were a total of 15 conferences on low vision in the United States. So far as I know, this is the first one to deal with the distance uses of small amounts of residual vision.

One of the things which always happens at conferences which take a "multi-disciplinary approach" is that the participants spend a great deal of time haggling over terminology. This was true of the Low Vision Conference to a much lesser degree than was expected. One of the reasons was that a goodly proportion of the participants were younger professionals in the disciplines represented. They tended to be more well-read and have greater flexibility in problem solving and in concept development than their gray-bearded, sage mentors. One of the rare phenomena of this conference was that the conference authority figures, ophthalmologists and optometrists primarily, had a difficult time maintaining their footing among a group of young people who were more vitally interested with problems of low vision persons in their regular life patterns than in a clinical setting. The proceedings of this conference then represents an interplay between new definitions of the problems of low vision persons and old definitions, between authorities in the field and young professionals, between disciplines and between the need to hear and the need to speak.

A post-conference survey indicated a shift within the conferees toward a new interest in distance uses of low vision. "I learned something." "I am more interested in low vision." "We need better eye information." "There should be less reliance on eye doctors." "I understand where my own discipline fits into the picture." "There should be more eye research." "We need to change the use of the word 'blindness'".

This conference is not an isolated manifestation of the burgeoning interest of Orientation and Mobility people in the training of their clients' residual vision. Some of the universities which have programs for training mobility professionals

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are taking another look at the need to develop better programming in this area. Hopefully, these proceedings and their selected papers will furnish a better focal point for the university personnel and practitioners in the field.

I wish to thank my wife, Marianne, who is also an Orientation and Mobility Specialist, for her advice and assistance in the development of the conference and the preparation of the proceedings. I have a debt of gratitude also to Dr. Mark P. Graeber, Chief of Staff, VA Hospital, Palo Alto for his encouragement and support and for the support of the VA Hospital. Stanford University administered the grant for the conference with a great deal of the work falling on the shoulders of Joanne Wise, the project's clerk. Our good friend and ex-secretary Dorothy Spiegelberg waded through the articulate and inarticulate speeches which were recorded on tape and typed the first transcripts. After this act of heroism, she typed the final drafts of this document.

L. E. Apple

Loyal E. Apple
Conference Chairman

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INTRODUCTION

Loyal E. Apple, Chief
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This conference is under the sponsorship of the United States Office of Education, through an amendment to a grant held by Stanford University, Palo Alto, California. We are grateful to the Office of Education for their interest in this particular approach to the subject of Low Vision. During 1970, the Office of Education has invested much effort in the development of a heightened awareness of Low Vision among educators and rehabilitation workers.

We are deeply grateful for the support and encouragement of Josephine Taylor, Coordinator, Bureau of Education for the Handicapped, and the conference planning committee, Natalie Barraga, Donald Blasch, Richard E. Hoover, Newell C. Kephart and Russell C. Williams.

The theme of the conference is "Visual Abilities -- Their Behavioral Assessment and Possible Methods for Their Improvement in the Individual with Severe Visual Impairment".

The term low vision has various usages. It is sometimes applied to persons with corrected visual acuity of 20/70 or less. It is used here to refer to persons with corrected visual acuity of 20/200 or less or a field of less than 20 degrees. Some professionals refer to this as severe visual impairment. In keeping with current practice, the term partially sighted will be used for individuals with visual acuity 20/70 to 20/200.

The aims proposed for the conference are:

a. To assemble information which would lead to the development of methods for improving visual performance including distance vision and adjustment of persons with severe visual impairment.

b. To develop research goals and to stimulate research interest in the unique aspects of human adjustment to this type of disability.

c. To publish the above for the use of professionals dealing with children and adults with low vision.

d. Although it is not the immediate aim of the conference, I can foresee the need for a new discipline, Low Vision Specialist, or a modification of known disciplines such as Mobility to include this aspect.

There are approximately four hundred practicing Mobility Specialists in the United States today. Of these, it is estimated that 50% are working with children. At least 60% of their students or clients have useable vision. There has been no notable attempt by these specialists to apply what is known about vision training to the visual abilities of their students, although there is a considerable amount of information available from perceptual psychologists, teachers of low vision children, teachers of the perceptually handicapped and optometrists who deal with perceptual difficulties. Most of the techniques which are now used by Mobility Specialists are modifications of those used with the totally blind. These have limitations in that they ignore any possible gain in personal abilities or social adjustment which might come from vision training.

This is not to be construed as a criticism of the field. Indeed, formal training for Mobility Specialists in the university setting has only been available ten years. The majority of the practitioners have only been in the field four years or less. As the discipline matures, it will find ways to envelop new types of techniques.

It is my firmly held opinion that the assistance which is needed by Mobility Specialists working with low vision children and adults is to be found in several fields. No single field has all the answers because no single field is interested in both distance vision training and low vision. Mobility Specialists are well educated individuals, usually with graduate work which includes courses in the human senses, psychology, physiology and education. They are academically prepared to take advantage of contributions from ophthalmology, optometry, perceptual psychology and education. The difficulty which Mobility Specialists face is that these disciplines draw up their information within their own frame of reference which is usually in terms of near vision, reading and the clinic or classroom environment. It is hoped that this conference will enable Mobility Specialists to interact with other disciplines in such a way that a new frame of reference can be established which is more functional for Mobility Specialists in terms of distance vision, movement and the less controlled environment.

Mobility Specialists will ultimately need answers to questions similar to the following:

1. What visual cues do low vision cases select to identify moving objects and determine their course, speed and distance?

2. Is it possible to develop pseudo-foveas through training of persons with central scotomas?

3. What tests could be used for assessing visual thresholds (size, brightness level, brightness-contrast, time) in low vision cases?

4. How much time and what kinds of experiences bring about the suppression of hemianopic visual fields in new hemianopsia cases?

I expect that in many ways, the Mobility Specialist will need information from other disciplines which these disciplines do not necessarily think significant or which may not now exist. For example, the eye examinations which we see never contain information on phenomena which have a bearing on functioning: phosphene activity, extinction, fluctuation, distortion of space or movement, significance of photophobia and effects of drugs on vision. In addition, very few perceptual psychologists see the relationship between what they know about vision and the fertile area of study of low vision. It is my guess that many of the visual phenomena of interest to perceptual psychologists will be more readily apparent among persons with low vision. Extinction is a phenomena which has been of vital interest to perceptual psychologists. We have found that this phenomena occurs with some frequency among low vision persons and it seems to be associated with photophobia about which very little information is available.

I tried to aid Mobility Specialists in finding relevant material by putting together a selected reading list which has been furnished to the conferees. I know that it contains publications on which each of the disciplines represented here might not agree. However, each publication listed has some bearing on the uses of distant vision, vision training or human adjustment. I would appreciate suggestions of conferees regarding this list and I would actively solicit lists of publications which you think would be applicable to Mobility.

Where do we find ourselves now in reference to the development of relevant information in other disciplines? The work which opened up new vistas in low vision was the work done by Natalie Barraga, University of Texas at Austin in 1964 with ten matched pairs of low vision children. The children who were taught with her near vision educational materials showed significant gains in visual effectiveness. The study has been replicated and has led to the development of teaching programs.

The best summary of what is currently known in the development of perception and vision training is contained in the recent book by Eleanor J. Gibson, Cornell University, entitled Principles of Perceptual Learning and Development. It contains some potentially useful methods for the functional assessment of vision. Any Mobility Specialist working with low vision persons should have and be familiar with the information contained in this book.

I am particularly fond of the work of the Gibsons, Eleanor and J. J., because it forms the theoretical base for the only programs for training distance vision of which I know. These programs are both under the Department of the Army, through contract with Human Resources Research Office. Francis Thomas at Fort Rucker, Alabama is training low level aerial observers in the use of peripheral vision and scanning for spotting targets on the ground. Elmo Miller and associates at Fort Bliss, Texas are training ground observers in rapid aircraft recognition based on transformation and distinctive features. Both of these programs offer interesting possibilities for application to the training of the vision of low vision persons.

Most of the work which is being done with hemianopic vision is being done by neurologists, outstanding among these is Morris Bender.

Within optometry, Donald Korb is doing some pioneer work with telescopic lenses for the operators of automobiles, in cooperation with the Department of Motor Vehicles in the state of Massachusetts. It is true that the act of walking destroys the stable platform necessary for the effective use of the present day telescopic lens but it is hoped that Dr. Korb's work may have some spin-off which will be applicable.

The ophthalmological work of recent vintage which has been the most help and seemed the most relevant is that of D. O. Harrington on The Visual Fields. It is a rare low vision person who does not have some sort of field defect.

Sociologists and educators who have given attention to the adjustment of partially sighted children and low vision adults give us the following picture:

a. Barbra Bateman (Reading and Psycho-linquistic Processes of Partially Sighted Child, unpub. Doc. Diss. University of Ill., 1962) in 1962 found that partially sighted children were characterized by greater child perception of pity and poorer parental understanding. She cites Underberg who found that the partially sighted were less able to accept their visual limitations than those whose handicaps are even more severe.

b. Karnes and Wollerstein (An Intensive Differential Diagnosis of Partially Sighted Child to Determine the Implications for Education, CEC, Natl. Ed. Assoc. Reprint Sept. '63) in 1963 found that these children were less well accepted by their peers and that 75 per cent had severe to moderate adjustment problems. The remaining 25 per cent had adequate total adjustment but mild problems in specific areas.

c. A study of the typical partially sighted child reported in 1966 by Ralph Peabody indicated that the outstanding characteristics of partially sighted children are underachievers, easily fatigued and emotional problems.

d. In 1967 Bateman (Janis L. Weltherell "Some Educational Characteristics of Partially Sighted Children" Intl. J. for Ed. of the Bl. Vol. 17 #2 Dec. '67 pp. 33-40) again turned to this area and compared severely impaired (low vision) with mildly impaired children (partially sighted). More severely impaired than mildly impaired were judged not to be socially acceptable to their peers. One fifth of the severely impaired were judged below average in emotional adjustment. Mildly impaired were more likely to have a normal adjustment.

All of the above studies place some reliance on subjective teacher observations. If indeed these children are not as emotionally disturbed as these studies indicate they are at best faced with a negative cultural stereotype illustrated by the teachers' opinions.

e. With regard to employment of adults with low vision, Bauman and Yoder, (Adjustment to Blindness) found that there is a slight tendency for those with useful residual vision to make positive moves toward independence and employment and those without to make negative moves. They concluded, however, that the number of persons with useable vision moving into employment was not of greater statistical significance than those without. We desperately need a more definitive picture of the psycho-social aspects of low vision.

The manner in which visual perception develops in the low vision child and the way in which vision is reorganized in the adult new to this state play a crucial role in their functioning and general adjustment. I charge you to recommend the avenues, techniques, modalities, equipment and procedures which should be tried to accomplish this end. Keep in mind that seeing better is only a part of the problem and that confidence and social adequacy are significant portions of the area to be covered. Propose those studies, research ideas and individual tasks which will result in more information about assessment of visual performance and ways of improving it to the benefit and human worth of the individual with low vision.

CHARACTERISTICS OF EYE CONDITIONS RELATED TO LOW VISION

Richard E. Hoover, M.D.

What we must ask ourselves here is how can individuals with recorded identical visual acuities be so different in visual ability? So much boils down to this simple querry which we all know is of real concern. We might ask if we would be better off in this country to adopt a functional measurement which might reflect this difference. I am not going to answer this but I am going to pose some very simple questions and point out some simple physiological factors. When we return to the group discussion, it will perhaps give us a base from which to start.

What physiological basis is there for assuming that one minute is the smallest visual angle resolvable by the normal human eye, and the five minute angle the normal threshold for perception and recognition of form, such as a letter? It is not based on any physiological principles but largely on experience and utility. In Robert Smith's book, "System of Complete Optics", Dr. Hook assures us "the sharpest eye cannot well distinguish any distance in heaven, such as the distance between stars which subtends a less angle at the eye than half a minute and hardly one in a hundred can distinguish when it subtends a minute." This is where most of our information came from. It was assumed since the minimum separable was one minute of arc in order to perceive form, the component parts of the object must subtend an angle of one minute. Since this seemed reasonable and was simple and uncomplicated, it was readily adopted for clinical use. Although still probably the best clinical test for detecting defects in the optical systems, its limitations should be appreciated. I would like to point out some of the limitations, not to be destructive, but I hope to help us build on a constructive platform.

You know routinely the records you receive have two measurements on them, that of visual acuity for distance and that of visual fields. You have no idea under what circumstances either was measured; either physical or emotional. Was the room dark or partially illuminated? At what distances were the measurements actually taken and what was the size of the test object? None of these is standardized and surely emotions and fatigue factors are not and cannot be easily measured.

Let us consider now the sense of vision. It is composed of light, form and color. If you cannot perceive light, you are blind; you have no sense of vision. If you can perceive light, you have part of the sense of vision. If you can manage form and color to a refined degree, you are approaching a perfect sense of vision.

Form has two major components, the minimum separable we mentioned earlier and that of aligning power or straight line acuity sometimes called vernier acuity. Certain recent tests including those of the astronauts have shown us the importance of this aspect of visual perception.

What are some of the physiological factors involved in vision? The light sense we have already mentioned. The visability of a single line on a background is very acute and can often be seen when there is only 0.5 seconds of arc under laboratory conditions. The minimum separable can actually be measured under laboratory conditions from one minute to 15 seconds of arc and discrimination of a break in the line can be measured as small as three seconds.

When reading letters on the Snellen chart, what are some of the other functions and what do they involve? Obviously, especially in some people, the power of attention itself is a complex function. It is not a simple matter. Attention is a very complex thing with psychological, motor and other aspects involved. The ability to direct the eyes so the image falls on the most sensitive part of the retina, called fixation, is a factor in reading the chart.

Factors influencing visual acuity are many, the greatest of these, of course, being the refractive error. Anybody who has been involved with people with low vision realizes how many of the people that come to the final assessment come without a proper refraction. Refractive error is probably the most frequent common element shared by all people who have sense of vision. Therefore, it deserves a lot of attention. Influence of the size of the pupil is another factor. How important is this? We know it is important but we don't know how important when we assess people who have severe visual impairment. The distance of the object from the observer and the extent of the surrounding field are factors. Another factor is the intensity of illumination. In some diseases, less light leads to greater visual ability. In many offices where acuity is taken, it is very bright, in others very dark. Some rooms are very short and some are very long depending on the rent district. Enough has already been said about this and its effect on visual acuity if not visual ability. The influence of the region of the retina on visual acuity is another factor. The legibility of various letters on the Snellen chart is itself an important factor in recording visual acuities for everyone knows that certain letters are much easier to identify even with good vision. And yet, you know, when we measure people with very severe visual impairment we usually guess at it by means of inaccurate methods. The variability of visual acuity with conditions of fatigue, drugs and physiological conditions must also be considered. There are a host of factors and we do have a general idea of what part some of them play in determining visual capacity. What I'm trying to say here in these few minutes is we must isolate the characteristics of the sense of vision and not confuse these with all other psychological and perceptual factors operating in the final measurement of visual acuity.

There are other visual abilities which we never isolate, rarely talk about and usually are never recorded. Some such examples are accommodation, binocular vision and color perception. They have an effect on the visual acuity at times and also can affect visual ability directly.

In summary then, what I'm saying is visual acuity alone as we measure it and whatever it stands for depends on many factors and furthermore, the visual ability of people may depend even more on these other factors. Etiology of the disease and we'll talk about that in just a moment, accommodation, binocularity, the fields (the form, size and color of the fields), the refraction, psychological effects and other factors which include a host of things which I alluded to and hopefully we will talk about in our group discussion are all to be considered as affecting an individual's visual ability.

Boiling it down as simply as possible, what are the mechanisms of visual loss? Number One are affection with the media, the media well known to us as the cornea, aqueous, the lens and vitreous. Any of these can be involved or affected in many ways. Obviously, they effect visual acuity but the visual acuity level which is measured does not in any way anticipate the visual capacity as compared to someone who might fall in the next category.

I like to use the word "production" here where the retina becomes involved. And again, one can have the same acuity as one might have with the media affected but the overall visual ability might be entirely different because there are other characteristics of the visual sense that are affected when the retinal productive elements or their circulatory support in the choroid become involved.

Transmission: We all know that nerve involvement, pathways and radiation clear back to the cortex can result in visual loss down to levels which can be simulated either by medial disease or by retinal disease. Here again you have visual ability being affected by what was the original cause of the visual loss.

The same applies to perception and recognition at the cortical level and here we have the same thing; visual acuity being identical to any of the others, but visual capacity and ability being entirely different. This makes a very simple way to think of it but ordinarily it is not done this way. It's never certainly interpreted this way when it's referred to anyone who must make some kind of a practical assessment of what the visual ability might be.

There are all kinds of ways fields can show restriction. A generalized depression in the field can come from involvement of the media in which case a very large object must be used to measure any field. Central scotomas from nerve and macular lesions, peripheral constriction due to retinal or nerve involvement or choroidal damage, arcuate defects from retinal damage and homonymous hemianoptic defects from pathway, radiation or cortical damage all give abnormal fields. Visual ability is affected depending on the degree of depression or scotoma density, the size and position. Again it must be remembered fields do vary too depending on object size, object color, examiner's alertness, subject's cooperation and other such variables.

There has been very little printed on the functional assessment of fields. Dr. Esterman[1] has published some work in this regard and certainly it is a beginning. I intend to show you a little bit, a small sample of what he has proposed in case you are not familiar with it. There are many things missing in his final evaluation of the functional assessment of visual fields but at least it is a start in this direction. This is a picture of the anatomy of the retina to at least give you an idea how the lesions in one part of the retina could be quite large and affect very little in the way of visual capacity whereas others can be quite small and affect large elements of the field. These pictures of visual defects that are involved show you the background as scotomas; vision could be very good or very poor in these, depending on how much the central rating is. We have no idea how this affects the capacity to perform; let us say -- to drive a car. Some of the retinitis pigmentosa patients I have seen continue to drive bulldozers and trucks with a tiny central field; some of them I found had these variances and how they can perform I have no idea but they do.

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[1]
Esterman, B., "Grids, etc.", I Tangent Screen, Arch. Ophth. V 77, June 1967.
Esterman, B., "Grids, etc.", II Perimeter, Arch. Ophth., Early 1968.

Esterman says that his method provides a simple and quick way of quantitative field evaluation based on function similar to what the Snellen scale does for central visual acuity. Like the Snellen scale it expresses values in per cent of an average standard. But like the Snellen scale, it has no physiological basis, and this is important to remember. Functionally, he says that certain parts of the visual fields have greater importance than others. These parts he has assigned higher values, based on the assumption of the following three principles: the center scores higher than the periphery; the lower hemisphere scores higher than the upper; and the peripheral field near the horizontal meridian scores higher than other parts of the periphery. You can make your own assessment as to whether these are important ones in terms of whether you are an airplane spotter or a coin collector.

These principles are expressed by the grid in that the units are smaller, closer together and therefore more numerous near the grid's center, as well as in its lower hemisphere and near the horizontal meridian. This makes the grid a relative value scale which reflects the greater importance of these areas. Each grid consists of 100 units; each unit equals 1%. A simple count of the units or dots within the field yields the direct score, in per cent, of the fields function. Count the dots enclosed within this traced outline and the total is the functional field score in per cent. This is interesting. He has a central five degree area which contains no dots and is not scored. It's function is expressed separately by the Snellen scale. This isstandard for the perimeter grid is the same one published by the AMA Committee on Standards in 1958. Esterman's main idea is to give more of a chance to assess some function of the visual field capacity rather than referring all patients who do not have normal fields. It is obvious he does assess the fields as having greater value to the center and to the lower arc because here is where it drops off. Since Esterman did not consider acuity levels, colored test objects or variables in size, his method could probably be improved. It is, however, a step toward a complete functional measurement of the visual field.

What I have been trying to say here is that all the diagnoses you get, regardless of what they are in general fall into four main categories; Involvement of the media, the production elements, the transmission elements or the reception-recognition elements or a combination of these. Whatever the diagnosis happens to be, in terms of what we call it, it boils down to what do we have left? How important this is in trying to establish what eventual visual ability will be, I can't answer nor can anyone else.

All I can say is this. In trying to assess our visual capacity or ability, if you try to isolate tasks which require nothing but visual ability of one kind or another, it becomes a very, very difficult problem. You end up with very few visual tasks that somehow do not involve another capacity of the human being in order to make him work his way through the problem. No matter how you plan on certain progress or even think in terms of it you are faced with this very difficult problem of defining visual tasks in which the acuity or some part of the sense of vision or the combined characteristics of the sense of vision are the parts at work and not some of the other very important functions of perception and behavior.

MEASUREMENT OF VISUAL EFFECTIVENESS

David L. Knox, M.D.
Associate Professor
Johns Hopkins Univ. School of Medicine

I would like to translate my topic into "How Can We Improve The Information About a Given Patient That An Ophthalmologist Gives To The Rehabilitation Team." By identifying problem areas, perhaps we can evolve some improvement. Basically, most of the ophthalmologists who are giving primary care to these patients are in private practice. Some features about them need to be stated, because when you recognize their work habits and characteristics you can better understand what we get from them. They are busy delivering a health care product which in many circumstances ranges about 90% effective. They are busy with refractions, cataract extractions, operations for squint, management of glaucoma and conjunctivitis and there is a high demand for the services of these ophthalmologists. The end result of this is that many of these people do not have the time that is necessary to provide the information which should be of great concern to the specialist in rehabilitation, either of the partially sighted - the low vision patients - or those who are completely sightless.

As I talk to different people in the rehabilitation field, they report that the average practitioner many times expresses considerable lack of concern about what happens to the patient. There are times when they feel that even this ophthalmologist may be frankly hostile to questions or to being asked to think about his previous patient. In defense of the ophthalmologist, I think one must realize that he wants to prevent disease processes from happening, and he wants to apply treatment. He feels good when he is helping somebody and he ends up feeling bad when he fails. We all like to suppress the things that we don't feel good about. They end up asking the ophthalmologist for more than he can really give and the end result is two people who are sometimes unhappy with each other.

Another facet has to be identified. If somebody has a long standing problem which keeps on worsening, the ophthalmologist has had pass through his desk an unending stream of forms to be filled out. There are insurance, social security, unemployment, and income tax statements which because of the limited amount of time, he gets tired of filling out. Identifying these problems is the first step in developing ways to prevent them.

The information that the ophthalmologist can give is first to define, if he can, the cause of the disease process. Then he needs to define the locus of the disease process. Is it the cornea, the iris-lens diaphragm, the vitreous, or the optic nerve? Which part of the retina is it? Is it the cerebral lobes in some circumstances? Then he needs to define the character of both the vision deficit and the remaining vision. The final item, prognosis: is this a stable process or is this a steadily worsening process, helps everybody in their assessment.

The ophthalmologist goes about all of this by using the standard tools of medicine and ophthalmology. A history, an examination - a physical examination - in a sense which will be the meat of what I will be trying to define, and then finally the special laboratory information. The history that is important is the past experience of that patient, both in terms of his education and his vocational experience. Ocular history defines what happened when, how did it progress, what was done for it and what was seen. Many of these people with problems which end up needing rehabilitation have been to many different ophthalmologists and several different medical centers.

From the examination, I find that in all kinds of processes like this, people want numbers. They want per cent of visual effectiveness, they want visual acuity expressed in a number. I'm going to try to resist the temptation to go into what could be called numerology and try to stress that we need to know the quality of both the visual abilities and the visual disabilities.

Visual acuity techniques that we are now using seem to be fairly standard throughout the world, based on the Snellen test. They are those of form recognition of progressively decreasing size test objects tested at a standard distance. We also must test near vision and here acuity testing from the work of Dr. Louise Sloane uses a set of test cards both for distance and near vision with a group of letters which are not easy to memorize and say by rote like some of the standard AO and Bausch & Lombe eye charts. They are of the relative same difficulty as letters. O is easier to identify than an E from an R. A refraction as

Dick Hoover mentioned this morning is extremely important. At least once every ten days I see a patient who comes along for a medical evaluation for a strictly eye problem and the first thing that we do to help this patient feel that things are not as bad as he thinks is to do a decent refraction.

The next point is that these tests of visual acuity need to be done under standard illumination conditions. The most pertinent observation is that the syndromethat frequently causes severe central visual failure in young people as I see them is the syndrome of macular discaform process of edema and hemorrhage. We see patients who are sent in with the acuity of 20/100. I test them in my office and find 20/50 or 20/30. We then ask the patient, "How did your doctor test the vision?" Well, the patient says, "The room was dark and he had that little projector machine. He turned the switch and he shot a little line of light with dark letters on it down to the end of the room." One of the things we have found out about this particular syndrome is that with all the lights on in a room and a card on a wall with good lights on it at 20 feet, you're going to get better distance acuity. These patients also find they may read with their normal spectacle refraction by using a bright light. One of the things that's been left out of much of the testing that we do is the illumination at the time of the testing. This needs definition in creating data necessary to evaluate the patient with low vision.

I think we also as ophthalmologists have to raise the issue that when a patient has been sent for rehabilitation the question must always arise has the maximum, let us say, medical-surgical eye care which is available in America today, been applied to this patient, because like everything else, the quality of ophthalmic care is not uniform across the country.

Visual Fields: The forms that I see coming from all vocational rehabilitation people and the disability compensation requirements as I remember reading them ask for the widest area of the six or nine positions on the peripheral field as measured by 6 mm. white object on a perimeter at one-third of a meter. This comes out tc be a set of numbers. You draw them on a little diagram and it's what's the limit of the peripheral field as you bring the test object in from the side. Frankly, this is not enough for rehabilitation purposes. The things that need to be stressed are first of all, where are the things which we call scotomas (areas in which the patient does not see something)? Where are they located? How large are they? How dense are they? It is important in both mobility training and in reading training. These scotoma are assessed with greatest accuracy on the tangent screen in which a person sits at one meter from a flat screen that has a set of lines with varying size test objects. There are other devices available which are relatively standard and can give this kind of information such as the Goldman perimeter. We also need to know what are the location, size and sensitivity of areas where the patient does see.

In this regard, a patient has irregular central scotoma. He is seeing something like 20/70 with a tiny central island close to the fovea but it's such a small island that he does better with magnifying devices by being taught to shift over to an extra-foveal area which is larger and can then accommodate the letter which is enlarged by the magnifying devices. The Esterman concepts of the shape and location of the size of the peripheral field are important with greater importance for the lower and lateral fields. I think the business of putting a number on this such as a 56% field by Esterman techniques, is nice information but I think we need to know more than the number 56 per cent.

Again, the testing conditions for visual fields are just as important as they are for acuity and illumination is just as important. Bright light will help some patients with macular retinal edema. It obviously helps those patients with retinitis pigmentosa. I have the feeling that people with optic nerve troubles tend to get into trouble when the light is too bright.

We are not developing at this point techniques for testing contrasts, shadow of objects or objects which have a light side or a dark side which are clues in recognition of them as objects. Detection of movement is something for which we have not developed standardized testing situations. Another problem is glare. When it's a very bright day you do have shadows which provide contrast and therefore give the patient clues that there are things there that need to be appreciated, particularly in mobility training. Glare may exhaust the whole retinal function.

Another problem is that of retinal recovery. Some of our patients tell us they see very well when outdoors but if they go inside into a poorly illuminated area, they don't see as well and it may take 15 or 20 minutes for them to somehow reset their retina or readjust the sensitivity of the retina for this less bright illumination.

The last point is prognosis. Prognosis is dependent upon say knowledge of family history, knowledge of the history of the ocular illness, the knowledge of similar patients with the same kind of process. In the business of trying to assess the whole process of getting the information from the ophthalmologist to the rehabilitation personnel, I am not going to try to attempt to define the rehabilitation person's role in this but I do think that we can say that there needs to be - this is kind of a trite term - increased communication.

Assessing all of these things has led me to the point of wanting to suggest some solutions and the first one is again a rather trite one, but I think that in modern American technology today, we have to develop for many things what is called the team approach. The content of the members of the team in this particular circumstance; an ophthalmologist, a technician for performing visual fields and working with reading aids, a mobility-daily living specialist and then the fourth component would be a vocational counselor who is able to know what is available in the area of employment and what are the requirements for different job possibilities and then know the language of the three preceeding specialists who can tell him what this individual can do under the various vocational requirements.

In regards to the ophthalmologist, I think that you all as rehabilitation people have worked hard to try to develop techniques to try to get the information from the various primary ophthalmologists and I think I have the feeling you will have to abandon this to a certain extent and try to develop ophthalmologists who become a regular part of your team and develop an ophthalmologist who is interested in the problems of rehabilitation. This may make him a better ophthalmologist in terms of primary care and it also keeps you with an individual who has not been emotionally involved with the care of his patient who has not done well. This emotional involvement sometimes upsets the physician's judgment when things have not gone well.

I think the next thing is you have to give this ophthalmologist is time to work with the individual patient. It takes more time than the average ophthalmologist has in his private office with the telephone ringing, with emergencies happening and leftover patients from yesterday and somebody who wants to come in today instead of tomorrow. You must also give him time for developing the experience of seeing many different patients as a foundation of what I like to call syndromology. There are repeated patterns of behavior in patients and their diseases so that one obtains a feel for a certain kind of condition, one knows what to look for and what kind of behavior to expect. An ophthalmologist helping to work through the problems of patients with different kinds of rehabilitation is going to be more accurate and of more help in the prognosis and the management. An economic fact of life is that you're going to have to compensate these ophthalmologists for the time that they spend.

The hope has been expressed to me by Dick Hoover that somehow and some way we can evolve from this meeting a standard approach to these patients, a protocol which can be subjected to scientific analysis of comparisons, statistics and things like that. At this point, it must be stated that there is considerable difficulty in the scientific assessment of any therapeutic process because we have such variation in the behavior of individuals who are normal and such variations in the behavior of individuals who have abnormalities in any sphere. It is extremely difficult to plot what is going to happen to a normal 100 that have not been affected by any therapeutic process, apply a standard therapeutic process and see what happens to a second one hundred. It's going to be extremely difficult to come up with a scientific assessment of your therapeutic process. You may have to resort to the feeling that you are helping now more people than you didbefore but you must develop the numbers that are going to satisfy people who are going to say at the end of five years, "What have you done?" You must do things that will satisfy a hard-nosed statistician.

EFFECTS OF SEVERE VISUAL IMPAIRMENT ON PSYCHO-SOCIAL BEHAVIOR

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(This paper was not available for publication)

FUNCTIONAL ASSESSMENT OF LOW VISION

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The verb "to see" is a marvelous one -- marvelous both in its ubiquity and diversity. There are gathered here today providers of four groups of services. Each of these groups makes frequent use of our verb "to see"; operationally, each has a unique meaning for it.

Service #1 is the scientists' contribution -- the "norm-getters", I like to call those providing it. Their representatives here are visual scientists -- that is, they do research in what they call "vision" or "visual perception." They sit their subjects behind small diameter peepholes ("artificial pupils", they call them) and ask them to view a tiny light or maybe two ("point sources" they call them). The subject is then asked to report what he sees in this highly abstract situation. If the "norm-getter" be asked why he deletes all of the complexities of everyday living from his experimental conditions, he typically replies that it is done so that he may study a "pure" response uncontaminated by non-controlled factors. To the "norm-getter", this is "seeing", from whence are spawned his "norms".

Service #2 is that provided by the eye physicians and surgeons. "Ophthalmologists" the providers call themselves -- "eye doctoring" shall be my term for their services. To such providers, "seeing" is a function of the human eyeball, with its effectiveness being proportional to the intactness and health of that organ.

Group #3 are the visual care services, in which group, I an an optometrist, include myself. In the context of this conference, I think we merit the label of "vision-shorers"; that is those who by hook or crook (largely optical) endeavor to shore up the visual performance of our patients. To us, and I regret to have to say this, "to see" usually means to call the letters printed on a Snellen chart either on a distant wall or held in the hand, with the distance and manner of presentation (as well as the lack of context of the material) being declared as largely irrelevant to any question as to the efficiency of the "seeing".

Service #4 is that provided by what I shall call the "people-helping" gang. I am very happy that they are in largest numbers here because I feel they are the justification for this conference. They are the folks -- "mobility specialists", "peripatologists", "physical therapists", plus some others -- who are working with actual people and their real, everyday problems of living. It is the "people-helpers" who, in the final analysis, must take the contributions of the norm-getters, the eye-doctorers, and the vision-shorers and endeavor to put them together into individual human achievements.

Because the people-helping services operate so differently from those in any of the other three groups, providers in Groups 1, 2 and 3 can often be found looking down their noses at the "non-scientific" "people-helping" attempts to assist low-visioned and totally blind persons. Challenges like "What was your control group?" and "How many cases do you have?" are thrown grandiloquently around, apparently with the notion of getting the people-helpers to declare a moratorium on their services until the other three groups catch up. Ridiculous, of course, but what alternatives are there? This is one of the central issues which we have been called together to consider. Since the people-helping currently being done is better than no "people-helping" at all, obviously the services must be continued. So, maybe it is we of the other three groups represented here who are going to be called upon to change rather than vice versa. In what ways might we provide better assistance to the people-helpers?

Primarily, we might begin by realizing that the people-helpers have a legitimate problem. In our ivory towers (and in "our" I include all three of the people-helping services) we tend to decide that anybody who can't solve all of the world's problems with the words and acts of wisdom which we make available to him must be either stupid or obstreperous, or both. Maybe out of this conference might come the devastating (to our egos) suggestion that what we've been contributing in the past has not yielded full measure of its potential value to the people-helping function. Also, it might take but a small change to, here and there at least, make that contribution of significantly greater value right now. It is with this view that the rest of this paper is presented.

Maybe we can persuade the norm-getters among us to consider turning their powerful techniques upon the successful low-visioned "traveler" and start determining what makes him "tick" -- possibly in contrast with one who has made an unsuccessful attempt to develop travel skills. It seems likely that if they are to do this, they will have to discard both of their pet "blue blankets" -- the artificial pupil and the point source -- and start learning how to study persons behaving under real life situations.

While "eye-doctoring" and "vision-shoring" (and we recognize that there may be those among the former group who would hold that their realm of professional competence would include shoring as well as doctoring) are differing areas of concern, they have a commonality in their commitment to remediation. In contrast with the norm-getters whose primary interest is in data gathering and analysis of how people behave under certain circumstances, services 2 and 3 have their major economic stakes in altering (hopefully, of course, for the better) certain human behaviors. They develop habilitative and rehabilitative techniques and devices and utilize them in efforts to achieve individual remediation. Innovation in these directions may be demanded from both of these services, although the challenge appears to be primarily to the vision-shoring function.

Group 2, the "eye-doctorers", are forced by the traditions of their specialty to practice in a framework in which any findings or recommendations which might emerge from a conference such as this may well be more or less irrelevant. No physician would think of, say enucleating an eyeball which posed no threat to the health of the patient merely on the grounds that such removal of the eye might make the patient a better traveler, even though that same physician may be well aware that many mobility trainees are blindfolded to eliminate distracting visual elements from the surrounds.

We vision-shorers are a difficult breed of cat, and some of us are remarkably thick-headed about it. However, I think we can accept the reminder that, in the long run, the justification for our professional existence is our success in assisting our patients to accomplish certain things which they value highly. If we can be persuaded, further, that for certain patients a very high value and priority is placed upon what the peripatologist calls mobility and orientation, then we can eventually be persuaded to devise remedial techniques and devices which will shore-up the visual components of mobility and orientation, especially if the norm-getters can be persuaded to provide us with a list of those performances and some suggestions as to how to go about effecting a clinical evaluation of them. Such long-range objectives might well provide a setting for a conference subsequent to this one.

Currently, however, is there anything which can be done through better communication and better use of information currently available? A guarded "yes" answer seems to be justified and I'd like to take these last few minutes allotted to me to outline what I see as some of the things toward which we might start moving, even today -- toward a more functional assessment of low vision than we currently provide.

First, the vision-shorer has quite a bit of information available from his current armamentarium with which he evaluates the low-visioned patient from the standpoints which the vision-shorer calls "visual acuity" and "visual fields" -- information which might be applied to assessment of the mobility and orientation skills of the client. It is probably a bit too much to ask the average vision-shorer, in today's "visual care" milieu, to attempt to translate such information. It is our proposal, rather, that the mobility specialist undertake such translation. Let us suggest some specifics:

VISUAL ACUITY SCORES

1. In general, it is probably wise to assume that a person who is reported to have a visual acuity of less than 5/200 is almost certain to be a candidate for special mobility and orientation training. Here the ability to discriminate even gross objects is becoming impaired and while the central field degeneration may well be greater than the peripheral field loss, with acuity less than 5/200 the client will probably have considerable difficulty in determining visually whether an object detected is a building or an automobile.

2. With visual acuity of less an 5/200, there is good chance that objects as small as, say, a man or a power pole may well be overlooked -- with painful and/or embarrassing consequences.

3. With a visual acuity scored as "light projection" or "light perception", there is an excellent chance that a client is going to be more hindered than helped by an attempt to interact with visual stimuli in his environment. In this area of visual acuity fall those who are better travelers when blindfolded, if for no other reason than that they are not then overwhelmed periodically by "white-out" produced by sudden exposure to strong glare sources -- sources such as auto headlights which may vanish as suddenly as they originally materialized -- leaving a frustrated and sometimes lost person who is unable to regain his "bearings".

4. Visual acuity scores are obtained from the center of the patient's field of view, and become increasingly meaningless for mobility and orientation purposes as the diameter of the field of view is reduced. In general, a patient with 20/20 visual acuity and a 5° visual field is far worse off, insofar as mobility and orientation performances are concerned, than is the patient with 10/200 central acuity and unrestricted visual fields.

VISUAL FIELDS INFORMATION

1. The visual acuity criterion for legal blindness does not, in general, represent any kind of a line of demarcation between the "cans" and the "cannots" insofar as mobility and orientation skills are concerned. Practically nobody whose limitations are confined to a visual acuity of 20/200 (between 1/4th and 1/5th of the total population of legally-blind persons) have any special mobility and orientation problems. Not so for these who qualify under the visual fields criterion. Anyone whose visual field is 20° or less is a candidate, right now, for special mobility and orientation assistance.

2. Visual fields measurements record what the vision-shorers call "form fields"; that is, the region within which the patient can detect the presence of a stationery, white object. Typically, within a region whose diameter is

1/3rd larger than the "form field", that same patient will have the ability to detect a moving object ("motion field" is the term applied here). The vision-shorer can tell the mobility specialist the diameter of the patient's motion field, as well as his form field, and if there is not the added leeway provided by the aforementioned 1/3rd larger diameter of the motion field, the patient will be more restricted than his form fields measurements would suggest.

3. In evaluating the patient's visual fields in terms only of the diameter of the form field, the vision-shorer may be depriving the mobility specialist of some very significant "fields" information. One of the more frustrating visual performances is that shown by a patient who has "islands" of blindness within his "form field". Objects presumed securely within his field of view may disappear suddenly and unaccountably. The vision-shorer can tell the mobility specialist rather precisely where, within the field of view, such islands exist and the latter can take that information into account in administering his training program. For such a client, the practice of looking just to the side of, rather than directly at, an object requiring identification may improve his ability to interact with it.

4. The vision-shorer can tell the mobility specialist (but usually needs prodding to do so) something about the extent to which the patient's skills at matching colors and reacting to them has been impaired. Increasing use of color-coded travel lines and signs in hospitals and other public areas lends added significance to this skill.

LOW VISION AIDS

When they use the phrase "low vision aids", most vision-shorers refer primarily to the optical devices known as ophthalmic telescopes and ophthalmic microscopes. Both of these contrivances are used primarily to produce magnification, telescopes by dint of some optical prestidigititation and microscopes by allowing objects to be brought into focus very close to the user. They are both devices which tie in with "visual acuity" and "reading" (or other near-point work) skills and which, if anything, have militated against mobility and orientation efforts. Some points are of particular relevance to mobility specialists, with respect to these aids:

1. In contrast with conventional spectacles, the functional properties of most ophthalmic telescopes and microscopes can be evaluated by the mobility specialist by the simple device of looking through them himself. Whatever he has to do to get the "world" in focus will be the same thing the low-visioned user will have to do; also, whatever he sees will certainly be no less (often much more) than the low-visioned client himself will see. In other words, if you want to know what kind of mobility and orientation road-blocks his low vision aid is producing for your client, try the aid yourself.

2. A trial of the above suggestion will yield only one answer to the question of the side-effects of low vision aids on mobility and orientation -- "disaster". Here is where the old saw arose, "If you are not legally blind, use a low vision aid and you will be." The effect of ophthalmic telescopes and microscopes (especially the former) on the visual field of the user is catastrophic insofar as travel, while wearing the aids as spectacles, is concerned. If the client needs such devices for vocational or avocational purposes, some method of getting them out of the way when he wishes to travel must be found.

3. Assorted solutions available for this problem of getting the low vision aids out of the act when the client desires to travel include:

   a. The client may have two pair of glasses, one of which incorporates the aid and the other of which does not. He then switches back and forth between them depending upon what he is endeavoring to do at the moment.

   b. The client may have the equivalent of "bifocals" in his glasses. By that I mean an arrangement whereby his spectacle lenses have a small area incorporating the low vision aid, with the major portion of the lens provides his conventional lenses. The optical field restrictions thus occur only when he looks through the "aid" bifocal.

   c. The low vision aids are hand-held or stand-mounted, with the client bringing them into use temporarily when the occasion arises. Such an arrangement is particularly effective in travel situations where

> the name of a bus, the number of a house, or a street sign must be read. A palm-sized pocket telescope has made it possible for many a low-visioned traveler to thread his way through a complex urban setting where, occasionally, detailed information secured through the use of temporary magnification is essential to his success.

I want to stop here to give you the chance to chew over some of these ideas in our buzz sessions which follow.

VISUAL PERCEPTION AS IT RELATES TO LOW VISION

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It might be profitable for us to consider the function of vision as it relates to the learning of the child and his adjustment to his environment. This might be represented by a diagram, the central portion of which is labeled information and the periphery is labeled with the sensory avenues through which, in education, we transmit most of the information which the child receives. We should also consider the other sensory avenues, taste, smell and the like but in education we don't use those extensively. Each sensory avenue contributes quantitatively to this body of information. That is to say, a certain amount of information about the environment is transmitted by each of the sensory avenues independently. From your point of view, this involves in the area of vision the problem of acuity because the individual must have a sufficient resolving power to identify aspects of his environment and elements of the visual display. It also will involve the problem of fields because this is related to the quantity of information which is transmitted at any one instance of time.

After the information has been received, we come to our major problem in perception, organization and integration of this information. I refer to this section as, "a body of information" not "a collection of information", because "body of information" implies that the data are put together and systematized in some fashion. For the human organism, there are two basic systems under which we organize information, space and time. The visual sense avenue is our primary source of spatial information. This is due psychologically, I believe, to the fact that vision presents more depths of information in a spatial display per unit of time than does any other thing. The temporal structure is primarily fed by audition and, to a certain extent, by the tactual sense because auditory information is extended in time. From the point of view of visual information then, the problem is to construct an organized system of data. This system will be primarily the spatial system and, for us at least in our civilization, it will be the three dimensional system represented by Eucledian geometry.

There are two aspects to the visual contribution to this system. The first of these is form which is the putting together of the elements of a perception into a total which will give rise to a unique following. A square, for example, is form. It is composed of four lines but the aspect of the form, the squareness, is not a function of the lines themselves. It is the function of the relationship between these lines. In my business with children with learning disabilities, we see many children who have the four lines but they are unable to put them together. The classic illustration is one presented by Strauss in which a child drew a square with four lines that didn't meet in the corners. Strauss, being educationally oriented, immediately pointed out his error. "That's wrong. It is not a square. The corners are not closed. You must close the corners. Then it will be a square." Whereupon the child very carefully closed each corner with a separate line. Now the suggestion here is that this child has received the quantity of information but he has not organized and integrated that information. Consequently, the unique aspect of this form's "squareness" has not emerged from his manipulation from the relationship between these elements.

The great efficiency of form perception is that it permits us to manipulate a large mass of data on a limited set of proofs. If you have the quality "square" and you have one or a limited number of the visual data, you can put this together and make a square out of it; the "squareness" will emerge and subtend the additional data. For example, if your problem is to distinguish between a square and a triangle, once you have the form concept you can dispense with a large number of the data, visual data here, and still have the essential distinction. This gives us great efficiency because with a minimum of visual data we can do a maximum of manipulating. Psychologists have for years posed the experiment in which the whole bottom half of a line of print has been removed and the individual can read very adequately seeing only the top half of the line of print. This is because we are able to take a limited number of data, through the organization of those data into form, subtend the additional data without searching for it visually.

With more extensive display, the organization which is similar to form is space structure. This is the structuring of objects in relationship to each other in space. This structure in our civilization is a three dimensional structure and follows the rules of Eucledian geometry for it is a matrix on which each object is located with respect to each other. Because of this location, those objects remain stable in space for the child and the relationship between these objects are preserved for the child. Normally developed mentally, the child first locates the object in space with reference to himself. This is what we call subjective orientation. He can say, with reference to me, that object is over there. But this kind of subjective orientation does not give him any information of the relationship of that object to another object. In order to do that he has to refer back to me every time.

Objective space structure, which has been described by James Gibson, is the orientation of each of these objects in relationship to each other on a matrix at the same time. This does the same thing for us in space that form perception did with near objects which we can handle. It permits us to operate on the basis of a limited set of data and make a maximum amount of information out of it. But if we have a space structure, we need only catch a point of orientation occasionally. We can find our way through this maze of objects because they are all located on our matrix and we know exactly where they are.

This body of information (set of structures, form and space) normally is militated by the visual data. Strauss pointed out that this was probably due to two facts: psychologically, you get more data per unit of time from vision than you do from any other sense and; the visual projection area of the cortex is larger than the projection area of any other sense. Normally, this body of spatial and form information is built up on the basis of visual displays, although it is not necessary that it be built up in that way. It can be built up on the basis of auditory information, tactual information, and in certain animals on the basis of smell and so on. Each individual will organize this structure around a certain primary source of information. Other senses will be contributory to that source of information but one avenue will be the primary basis for the development of his particular structures. In some individuals, this will be vision. In other individuals, this will be audition, and vision will be confirmatory or elaborative of this. The sense avenue which the individual uses as the basis of his structure may not necessarily be his most efficient sensotomy. We have many youngsters who come to our clinic with terrible visual receptive processes. The amount of information they get through vision is extremely restricted but they've built their whole structure on this particular avenue. If you take that away from them you ruin their structure. A very good example - a little boy a week ago with visual acuity of between 20/100 and 20/200 came into our clinic with a report. The report came in from the ophthalmologist that this child had such poor vision that he could probably never learn to read. The only trouble with this report is somebody left it laying around and the kid read it. This youngster has very limited quality information from the visual sense so we thought the obvious thing to do is to cut the vision out and emphasize some other senses. So we put a blindfold on him. He instantly went right through the ceiling because his whole structure is based on this vision as a primary organizer. When you take that away from him his whole structure breaks up. Now the opposite youngster comes in and you tell him to write on the blackboard and when he's halfway through it you slip a blindfold over his eyes and he goes on writing as if nothing ever happened. His structure is built up tactually, auditorily and kinesthetically and vision is only a confirming sense.

Each of us organizes our structure around one sense as a whole and this sense may not be our most efficient sensotomy. Now from your point of view, of course, if you have a loss of vision as this individual had, and used vision as your basis of structure, you're in trouble. You're going to have to reorganize this structuring in some way so that you can make vision a secondary contributor to the structure rather than the primary contributor. On the other hand, an individual who's structure is built up on a different combination of these sensory avenues and vision is not the primary source of structure is not going to be greatly disturbed when he begins to lose sight. Very quickly he will pick up contributory clues from other senses because he didn't use vision this much in the first place. So one of the first things that I think we want to know when we talk about low vision is:

A. Does the individual have any structure at all? Is his structure adequate? Does it cover the range? Does it cover the kind of situations in which he finds himself?

B. What is the primary source of this structure? What sensory avenues is he using as the core of his structure?

The second function of vision is in the control of response. It's all very well to have this body of information, but the only way we know that anybody else has any information or any data is when he performs. If he behaves, he returns data. If he responds to data, we can assume the data is there. This is probably universally true. It has been suggested that none of the incoming information is conscious until an outward pattern is generated. We cannot separate the in-put aspect of perception from the out-put aspect of perception. These things are hyphenated terms -- in-put, out-put. Out-put is controlled by kinesthesis in which part of the energy of the response is fed back into the in-put end of the organism and is used for the purpose of control.

Our basic control in out-put is kinesthetic because kinesthetic information is constant. Everytime there is a movement, kinesthetic information is generated. Conversely, whenever there is kinesthetic information, there is movement, by definition. This is a continuous feedback of information and consequently, in development the primary control of movement should be through kinesthesis as the primary feedback mechanism because of its constancy. Feedback mechanisms based on visual, auditory and tactual information are not consistent in the way kinesthesis is.

Because of the intermittancy of these other modes of feedback, it is our feeling that they are best used as a monitoring feedback as opposed to kinesthesis which is used as a direct feedback. In a monitoring feedback, you work out a sort of a sampling. You start the movement, control it by kinesthesis, and use the monitoring sense, (i.e. vision) as an occasional check to see that you're in the right path. We see many children in our clinic who attempt to substitute one of these avenues for kinesthesis as a constant feedback. So you get a little youngster who goes up to the chalkboard and starts to write his name and his eye is glued right to the chalk and every single movement of the chalk is directly controlled by visual information. If you take the visual information away, if you slide your hand in front of his eyes, he stops writing because he can't go on anymore. He is using vision as a direct feedback instead of as a monitoring feedback. Now, obviously, if this youngster loses vision, he's in big trouble. The child on the other hand who is using vision as a monitoring feedback can lose a relatively large amount of visual data and still not be in any difficulty because he's only using this as a sampling feature anyway.

Now here again when we talk about the individual with low vision we want to insure that he is using vision as a monitoring type of feedback. So again when we get these children who are trying to use constant feedback we teach them how to use their vision in this manner. First we increase the kinesthetic information by using either weights or resistance just simply to increase the quantity of kinesthetic information. We do this blindfolded you see so the kinesthetic information is emphasized as strongly as we can and then when we get the movement under kinesthetic control, then we open his eyes. You can do this either by slipping an occluder in front of his face from time to time as he's making the movement, or you can do it by a big sheet which fits over the entire area of the movement with slip ties on so he can see his hand only when it comes out under the slip. The object here is to teach the use of vision as a monitoring feedback as opposed to a constant feedback.

I think particularly in the area of mobility, this monitoring feedback might be an important principle. If the individual had to have all of the visual data necessary to control the movement, he would be in great trouble. But if he can take a sample at regular intervals then a limited amount of visual data may provide a maximum amount of control. Furthermore, if he can monitor in this fashion then you can substitute audition for some of the normally visually monitored data or you can substitute action for the normally visually monitored data. This may be what happens with the use of the cane techniques.

From a perceptual point of view, our problem in dealing with the kinds of children I see, is to teach the child how to make the maximum amount of use with a minimum amount of data because everytime he has to search for increased data or refined data, he loses confidence and he increases the probability of error. If on the other hand, he can take the data which he can readily achieve, he can blow this data out into a large amount of information either for the purpose of structuring or for the purpose of monitoring and we save him a lot of time and a lot of probability of error.

As I say, this is of more interest to me than to you, but you may be able to extrapalate some of the things we've been talking about here into some of the specific kinds of problems that you meet in the area of rehabilitation.

TRAINING METHODS FOR INCREASING VISUAL EFFECTIVENESS

Rosemary O'Brien
Program Coordinator for Visually Handicapped
Montgomery County Schools, Maryland

I am very glad to be here to tell you what we've been doing as educators of visually impaired children. I wish I could say that we had gone the second mile and applied this to distance vision but we have not except in terms of exploring the environment for application of concepts as we were able to do it. You are aware that Dr. Natalie Barraga is identified as a leader in this movement as a result of her doctoral dissertation published in 1963, and entitled: "Effects of Experimental Teaching on the Visual Behavior of Children Educated as Though They Had No Vision." Her stated purpose was to study the effects of specialized instruction with appropriate materials on the visual behavior of children educated as though they had no vision. She undertook to determine if the visual functioning of children could be significantly increased in an 8 week period of intensive teaching. Her subjects were children who were between the ages of 6 and 13, had no additional impairment, had an IQ of better than 80, attended residential schools for the blind and had a grade placement between the first and fifth grade.

The experimental group of ten children were paired with a control group of ten matched on pre-test scores on a test of visual discrimination developed for this study. All twenty of these children had been educated as though they had no vision. A third criterion group of ten with slightly greater degrees of vision who had used some visual materials was also selected. The children in the first two groups were taken daily in pairs for periods of 45 minutes for intensive instruction, taught a series of lessons planned for general visual improvement in the use of retinus materials. Lessons were taught by the investigator and effects were measured by pre-test and post-test administration of the visual discrimination test. Nineteen of the twenty showed greater than their matched control. A re-test correlation of the criterion group provided evidence of the reliability of the visual discrimination test. Her conclusions were that the short term intensive teaching procedures would increase significantly the visual efficiency of low vision children. Objective evidence was presented showing the value of visual stimulation programs for blind children with residual vision and the visual discrimination test is a reliable instrument for evaluating the visual functioning of children.

In 1965, Dr. Ashcroft decided to replicate that study for several reasons. He wanted to show that this instruction could be done by teachers with a moderate amount of training, that there is no special mystique that Natalie Barraga has to accomplish this, and that some different degrees of handicapped could profit from this training. This replication was done with Natalie Barraga and Carol Halliday and it confirmed the findings of the previous study.

In 1967, Ruth Holmes of Illinois State University did her Masters thesis on training residual vision in adolescents educated previously as non-visual. Her study confirmed the findings of the Barraga and Ashcroft studies.

That same year, when I took charge of the program for the visually handicapped in Montgomery County I bought sufficient copies of this research for inservice study and staff development. We began to evaluate children and to select them for this kind of instruction.

Dr. Barraga outlined four developmental stages of visual discrimination and recognition and they are listed on page 112 of her study. In Stage I, tactual and visual stimulation for discrimination and recognition of geometric forms and solid black and an outline shape ordering for size and relationships in left to right progression. Stage II, visual stimulation for discrimination and recognition of object forms in solid black outline drawings and outlines with inner details with discussion of class categories, uses and descriptive words. Stage III, visual stimulation for discrimination and recognition of individual objects within groups of objects, similarities and differences among objects, stories sequence with pictures, figure-gram discriminations and discrimination and recognition of letter symbols. In Stage IV, visual stimulation for discrimination and recognition of word symbols and word combinations with pictures.

Although ours, like most public school programs, has a core enrollment of children who use Braille, most of our children read large print and/or regular print and recorded materials for content learning and these children usually become print oriented very early. For this reason our lesson development does not necessarily follow the sequence outlined by Barraga. Her study, as you know, was limited for use with children who were blind or had been educated as though they were blind.

How then do we select the children for this instruction? Children are given the visual efficiency measure if they meet any of the following criteria:

Visual acuity between 5/200 and light perception

Braille users with acuities above 5/200

Non-readers, kindergarten or otherwise

Show resistance to use of classroom materials or show evidence of difficulty with using the vision they should seem to have as far as their eye reports are concerned

Results of the measure are recorded on profile sheets designed on a continum of visual behaviors. This provides a diagnostic look at the child's visual developmental stage and a basis for creative prescriptive teaching.

In Lesson One, we're working for form and size discrimination and our objectives are to make tactual and visual discrimination of pegs of different sizes by arranging them sequentially according to diminshing heights and diameters and to relate appropriate terms of comparison in noting height and diameter. We use both the home-made dowel type pegs and the Montessori pegs.

In Lesson Two, again, we're working on form and size discrimination and our objectives are to reinforce concepts for size and order sequence developed in Lesson One, to demonstrate visual discrimination of size likenesses and differences of pegs pictures in solid black by matching illustrations and arranging them in ordered sequence according to height and diameter.

Lesson Three, again we're working for form and size discrimination. Our objective is to discriminate tactually and visually, similarities and differences of size of a variety of objects.

In Lesson Four, in addition to form and size discrimination, we're working for pattern detail and outline detail and our objective is to identify by name, the circles, square and triangle, in solid black, and to match them to corresponding shapes and outline form; to make tactual and visual discrimination of the three visual shapes: round, square and triangular, and to identify each by name, and, to arrange each in ordered sequence according to size.

Lesson Five, then, to identify by name: circle, square and triangle in solid black and to match them to corresponding shapes and outline form; to demonstrate tactual and visual discrimination of additional geometric forms, plane, solid black, and outline forms; and to arrange outline forms in ordered sequence.

Our Graphic Arts Department has been very helpful in developing these things and when we do publish our book sometime after the first of the year, we will have a separate resources packet to include this sort of thing. It's not too easy to come by. The plane forms can be made by Industrial Arts classes if you can get a cooperative teacher interested.

In Lesson Six, we are working for object integration and our objective is to demonstrate visual organization by assembling four piece puzzles of four plane geometric forms: square, circle, triangle and star, and to name each one. There are a number of commercial materials that give you these, but they're very easy to make.

In Lesson Seven, we are working for color discrimination and our objectives are: to identify and name the three primary colors: orange, green and purple; and to reinforce discrimination and identification of selected geometric shapes familiar to the child.

In Lesson Eight, we're working for form density and our objectives are: to demonstrate discrimination of shades of each primary and secondary color to the extent possible for every child; to use appropriate words of comparison and identification of dark, medium and light shades; and to demonstrate recognition and appreciation of colors in the environment by discussion of observed colors in terms of preference and appeal.

In Lesson Nine, we're working for form and size discrimination, outline and pattern detail, object discrimination and categorizing; and our objectives are: to demonstrate discrimination and identification between pictured object forms of animals, toys and clothing on solid black in three diminishing sizes, two inch, one inch and three-quarter inch; to describe contour detail in familiar terms such as roundness, corners, straight lines and so forth and to separate objects according to group classification.

In Lesson Ten, we're working on the same developmental visual behaviors as previously in Lesson Nine except that this time we're using household objects and tools, and we have essentially the same objectives.

In Lesson Eleven, we begin for the first time to use some Marianne Frostig materials. We're working for form discrimination and object discrimination, outline and pattern detail, and figure detail, and our objectives are: to recognize and identify geometric shapes in outline form; to identify geometric shapes consistently within the context of outline drawing; to identify an outline Gestalt and perceive familiar geometric shapes in the drawing.

In Lesson Twelve, we're working on the same developmental behaviors as Eleven and our objectives are to recognize illustrations of familiar objects with the outline and some inner details in black, and in three diminishing sizes; to reinforce discrimination of contours such as roundness and pointedness; and, to separate objects according to classification.

In Lesson Thirteen, we're working for outline detail and spatial position and our objective is to identify outline drawings of objects and shapes presented in identical positions from among similar objects and shapes in varying positions.

In Lesson Fourteen, we're working on figure detail and our objective is to recognize within outline drawings of identical shapes, the varying positions of detail.

In Lesson Fifteen, again we are teaching outline detail, spatial position and figure detail, and our objective is to recognize within similar outline forms, the varying positions of detail.

In Lesson Sixteen, we're working on object discrimination, outline detail, and figure detail, and our our objectives are: to demonstrate recognition of similar outline drawings of familiar objects by separating according to classification; and to name the pictured object. This is the match me game, The Red Deck.

In Lesson Seventeen, we're working on the same developmental behaviors as in Sixteen and our objective is to demonstrate discrimination of identical pictures in a group of similar outline drawings, by matching the identical pictures.

In Lesson Eighteen, we're working on object discrimination and figure detail and our objectives are: to recognize a variety of objects pictured in color and pertinent inner detail using some of the object forms presented in Lessons Nine, Ten, Twelve, Sixteen and Seventeen; to reinforce discrimination of contours such as roundness and pointedness; and to separate objects according to group classification.

In Lesson Nineteen, we're working for form density, object discrimination and written figures and our objectives are: to locate designated shapes within a pictured scene, to demonstrate recognition and appreciation of color and other forms as they contribute to the total scene.

In Lesson Twenty, we're working for outline detail and spatial position and our objective is to demonstrate discrimination of likenesses and differences of outline drawings of similar objects in terms of shape or detail.

In Lesson Twenty-One, we're working on spatial position and our objectives are: to display the ability to color within a specified area; and to demonstrate perception of likenesses and differences by reproducing an original figure.

In Lesson Twenty-Two, we're working on visual closure and outline detail and our objective is to add the missing parts to complete the figure, after comparing it with one which is complete.

In Lesson Twenty-Three, we're working for object integration. Our objective is to demonstrate visual organization by assembling puzzles which picture fruit and animals and people.

In Lesson Twenty-Four, we've come to story sequence and symbolic representation of ideas. Our objectives are: to verify comprehension of pictures while arranging them in a sequence to tell a story; to show appreciation of pictures of incidents that tell a familiar story by comments and/or attitude toward the activities. Using the Sunday funnies that do not have too much print in them is very effective for this. These are the See Quees.

In Lesson Twenty-Five, we're working for size discrimination and outline detail and our objective is to discriminate visually, similarities and differences of size of a variety of familiar shapes pictured in outline form.

We feel that experiences in learning letter and word symbols may now be provided. Since the lower case letters appear in printed words more often than capital letters, we begin with those. Letters which are difficult to distinguish from one another because of their visual similarities comprise suggested groupings and we made our own work-sheets for these lessons.

In Lessons Thirty-One to Thirty-Three, we are working in similar ways with capital letters and we use the same words and materials that we used in the previous lessons to reinforce the beginning of a sight vocabulary. In the final lessons, thirty-four to thirty-seven, if the child has demonstrated that he has enough vision to read printed words, he is ready to concentrate on the development of a basic sight vocabulary but his ability to learn to read at this point is dependent upon many factors which influence all children's ability to learn to read. In addition, his severely limited vision which makes print reading difficult may seriously restrict his visual experiences even within his own environment. An increased sight vocabulary of words, naming familiar objects in his surroundings is important in stimulating his further interest in learning to read. We work with configuration, beginning consonants, and similarities and differences. If the development of further print reading is indicated for the child, a prescriptive program of procedures and materials suited to his age, grade and developmental level, should be planned at that point. It should again be emphasized that children will stop off at all levels along this continuim depending on their own visual problems or efficiency, and their other abilities. For some, print reading will be minimal. Our mobility specialists will be able to accomplish much with labels and signs in going to the grocery and drawing attention to appropriate print that they may encounter in this kind of setting. Record shops for adolescents are a effective resource for motivation. And of course, someone mentioned yesterday, the ability to see that street sign, is a great source of motivation.

For some, print reading will always be minimal and won't go beyond reading labels and some signs. Others may be able to use print for subject matter, such as spelling and mathematics, and will have an auxillary tool to Braille. Ideally, perhaps some of them will go on to utilize print as their mode of reading. As the child progresses through these lessons, the vision teacher uses every opportunity to explore the environment to make application of the lesson all along the way. For some of the younger children particularly, we recommend initiation of a scrapbook of "Seeing Experiences". In this way, they have something to take home, something to build on and something that they can be involved with besides the actual formal lesson. Classroom teachers, physical education teachers and the mobility specialists are encouraged to expect the child to see and to provide opportunities for him to successfully use his vision all day. In spite of all this, I think we must always emphasize that we're not trying to change blind children into seeing children but we want simply to make them aware that they do have some vision and to help them find ways to use it.

Now, except for the work that Marianne and Carol mentioned going on at Palo Alto, I know of no attempt to set up any kind of assessment criteria for distance vision in relation to discrimination and recognition of environmental objects and I think perhaps this would be necessary as a place to begin. Not whether or not the person is able to recognize something as a named object, but whether he is able to describe what he's seeing in terms of linear proportions and general curvatures, and at what distance and in what kinds of illumination, this is possible.

I, frankly, haven't researched this area for psychological implications and certainly you who are experienced in working with the adventiously blinded adults know a great deal more about that. We realize that the psychological and emotional factors are very influential in a person's ability to attend to and direct thought to determining the nature of the object which he is approaching. We may find that it is possible to translate some of the behavioral objectives especially in relation to the discrimination of form and contour into distant kinds of activities. It may be appropriate for us to focus on the fact that discrimination and perceptual use of low vision is learned and is a matter of attention and the ability to eliminate irrelevant cues and to make discriminations on the basis of some visual frame of reference. Therefore, the same kind of training procedures through using low vision to pick out discrimination cues and environmental objects would be useful. The person would, at least it seems to me, need to have much practice and much guidance and support by a sighted person in communicating how much he is able to see, at what distance and in what kind of light, and how it appears to him. In other words, he needs to find for himself a lobal form and contour frame of reference which, I should think, would be most helpful in mobility. We must approach this work with adults recognizing the functional differences between the visually impaired child and the congenitally impaired child and the adult who has just lost his sight. The adult will have a background of sighted concepts, some experiences from which to draw partial sight, for most of them, may furnish enough clues for the memory to fill in the gaps. It would seem that our first task would be one of setting up a profile, perhaps similar to the one we use now for near vision, for developing levels of efficiency of visual abilities that are applicable to distance vision. Once diagnostic determination of the deficits can be made, then utilization of residual distance vision can be trained.

CLOSING REMARKS

Georgia Lee Abel
Department Special Education
San Francisco State College

I would think the first frustration would be, "Oh what a complicated phenomena is the sense of vision." Both for the improvement of it, the enhancement of it or the complications and problems of living with it both for the person and the society in which he moves. Added to this is, "Oh what a complication is our understanding of perception", reading as we do all the various theoretical approaches to it and being aware of the research pertaining thereto.

I am concerned about quantitative versus qualitative evaluation. As I saw my group and the other groups talking we got a little closer to getting away from this. We became less likely to throw out the quantitative in order to have the qualitative but wanting improvement in both of them. I think in the group as a whole the demand was for better reporting in order that we might proceed more effectively with a prescription for the rehabilitation process. In order to do this, we raised many, many questions about how we get at it and we had an elaborate suggestion or design by Dr. Margach.

It would seem that another frustration was the problem of trying to separate out that which was visual. There was the comment that you sometimes, in order to neatly describe and define, manipulate the human being in such a way that you may indeed interfere with the total process.

I was at a meeting last week which offers some parallels to this discussion in which we had a whole afternoon on behavior modification. Finally, we got to the point where we could quit worshipping the disciples of each of the schools of behavior modification and try to sort of integrate what they were saying in terms of how they related to a human being. I think we are seeing a great deal more question asking on the part of all of us regardless of our discipline and it seems to me that is the best place of all to begin.

We realize what a complicated process this is. The process of vision and using it grows from pre-school on. It is indeed a growing process and there are differences between congenital problems and the adults who once had vision. The excitement in the groups stemmed from, the realization by those who were representing places like the VA Hospital, civilian agencies, and schools that we do begin at different places with some of these procedures. Many times we'd almost forget we were here to think about mobility instruction and how we can improve it. I think we begin to see a great deal more of the application this morning of what we know in terms of trying to find out precise measures. Sometimes we wonder if these precise measures aren't to benefit the understanding of the 20/20 vision workers.

I truly hope that this all can be integrated and we can have a chance to see it in greater detail. I feel that we have some great minds here and every minute we weren't using them we felt cheated. Hopefully we can get to the marriage of the quantitative and qualitative planning and research including all the appropriate scientists if we will.

SUMMARY OF GROUP DISCUSSIONS

CHARACTERISTICS OF EYE CONDITIONS RELATED TO LOW VISION

Richard E. Hoover, M.D.

Now as I try to condense and arrive at a consensus of the feeling of all groups which reported back, the following opinions seem indicated:

There is unanimity of agreement that characteristics of eye conditions do have a direct and important bearing on visual function of persons with severe visual impairment and that this effect cannot be accurately or adequately predicted from a report of visual acuity alone as usually reported. There is further agreement that just how much these characteristics affect visual performance in general is not precisely known.

A conglomerate list suggested from all groups and listed in random order which practitioners have proposed as important for performing by visual maans are: visual acuity accurately measured under standard conditions at levels of lesser and greater illumination, etc; pain; light and dark adaptation; fixation and fixation patterns; ability to judge depth; accommodation; color awareness; fields, both objective and subjective, including character and density; possibility of damage from use of physical activity; other characteristics of a larger syndrome such as diabetes, multiple sclerosis, rubella and what not. There are others and we don't expect this list to be complete but you can see that it is not a short list by any means. It has been suggested that until such characteristics have been identified, as accurately measured as possible under some standard conditions, then precisely and accurately recorded, their exact effect will never be properly analyzed or predicted. It was further felt that feedback under just as accurate and precise control by trained observers and workers with people of all ages and kinds with severe visual impairment will be needed to isolate, determine and validate the worth of such measurements as predictors of visual capacity - perhaps not even then.

This leads me to conclude that research methods to help predict visual ability or effectiveness must include more than just visual acuity under "by chance condition". What other characteristics will eventually prove to be of constructive predictive value will probably only result from a team approach of carefully prepared and interested investigators following a rather exact and probably comprehensive protocol of measuring, gathering, assessing and reporting data as it relates to function.

SUMMARY OF GROUP DISCUSSIONS

MEASUREMENT OF VISUAL EFFECTIVENESS

David L. Knox*, M.D.

These are the notes Dr. Knox would like me to present. Present methods of testing and reporting visual acuity and fields seem to be of dubious value in rehabilitation. Lack of standardization of testing and reporting procedures seems to be responsible for frequent undergrading of visual abilities. The average ophthalmologist is not trained nor does he take the time to provide detailed, functional information.

Ophthalmic residency training programs should include time in observing and participating in rehabilitation programs. Experience has shown that ophthalmologists with this training provide better and more informative reports. It may be necessary to train special technicians to provide this information. Rehabilitation specialists should develop practical test tasks as special modes of evaluating visual abilities.

There is considerable need for improvement in communication in rehabilitation personnel and the ophthalmologist. Lack of understanding of ocular physiology and the particular pathologic process may inhibit or modify both mobility and reading training. Technical understanding is more important in rehabilitation of the low vision and partially sighted than that person who has no sight.

Research goals should be directed toward improving the effectiveness and speed of rehabilitation. Specific problems center on improving the assessment of visual abilities and establishing standards and validity of different testing techniques.

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*Remarks were read by Mr. Wilfred Kingsley, Asst. Chief, VAH, Westhaven, Conn.

SUMMARY OF GROUP DISCUSSIONS

FUNCTIONAL ASSESSMENT OF LOW VISION

Charles B. Margach, O.D.

I am presenting my official paper now using the information gained from the reactions from my discussion group as to what I would propose for functional low vision. I would propose two work-shops. I would invite to each of the two work-shops the same group of people. The work-shop group that I would propose includes visual scientists. These are the folks I call the "norm getters" and would include optometrists and ophthalmologists, mobility specialists, educators of low vision children and possibly educational psychologists. Then the ones that would be added to this group are the people I'm calling "competent travelers". Those who have been successful in the judgment of the mobility specialists: travelers who have been good students and who have successfully learned how to negotiate our complicated environment. I would also have in the group some incompetent travelers. That is, students who have not been successful although maybe we would have to select from that group those that are judged to have had good motivation and not failed purely out of disinterest.

I would then suggest that these work-shops separate the groups initially. Have each group represented. Make a list of all the factors, not just the visual factors which they feel can be responsible for success at achieving mobility. The incompetent folks presumably would be asked to list the factors to which they attributed their failure. The lists should include factors that are deemed to make the clients in general educable not just for mobility but that would make them educable kinds of people. We certainly encounter folks who are, who generally seem to be uneducable no matter in what direction we try to help them. This is the work-shop that's going to make the list of factors which they believe are responsible for the success at achieving mobility. That is, whatever things that the competent traveler brings to and builds upon his success.

We must then move from this list of factors, one list from each group to a consolidated list of factors. We should then decide how to: 1. assess each of these factors, 2. how to improve, if possible, performance on each of these factors and 3. we would assess each of these factors that we have on this consolidated list using the methods of assessment proposed. We will assess them in each of the good, competent travelers and then we will assess the same factors in the incompetent group and then we can determine which of these factors, on the basis of this kind of assessment, prove out to be significantly different between the good and the incompetent travelers. Then out of this actual assessment of the factors, we would develop a standardized profile of initial strengths and weaknesses which can be used to predict which people are going to respond well to the mobility program in order to develop such a program against which standardized profile progress in the program can be evaluated and upon which the state of the patient at any particular time can be communicated to someone else who may be taking over the mobility training program either in another location or another person on the same staff.

The second work-shop which would have the same personnel and the same kind of group arrangement would endeavor to consolidate a list of the factors. The group's going to be there but we're going to have the mobility specialists and the travelers, both competent and incompetent, list those things which they feel are significant components of successful travel. This is not in terms of what factors are trained to make one a successful traveler, but rather in terms of what a successful traveler actually does. The main interest in one of our groups was that seemingly there is a lack of ways of identifying what the good traveler actually does and so I see these lists as being two entirely separate things. In the second list would be such things as the number of times he falls over a curb, the number of times he crosses a busy street or such factors as compared to the first one having such things as visual acuity and size of field and numerous other things. Then out of this list of skills which the competent traveler develops, we would decide how to assess these skills and then actually assess them, again in our competent group and our incompetent group, to develop a standardized profile by means of which to evaluate successful mobility against which a trainee's performance can be gauged, against which new training techniques can be evaluated and upon which information can be communicated to other professionals.

SUMMARY OF GROUP DISCUSSIONS

EFFECTS OF SEVERE VISUAL IMPAIRMENT ON PSYCHO-SOCIAL BEHAVIOR

Rev. Thomas J. Carroll

Some people object to doing any labeling of the congenitally blind or the congenitally low visioned mostly because they appear to recognize a qualitative difference between the psycho-social problems of the congenital group and the adventitious group. I felt that what I would call the "establishment people" were quite worried about anything that might attack the definition, as if any words about the definition might change it tomorrow. It was very clear that people saw the marginal position of the visually disabled or low vision person. One group reported that they took both the content and the thrust of Bob Scott's book and the statement of the speaker to say that perhaps we're making blind men out of these non-blind persons and suggested that we need to change our approach. And again, where the labeling comes in, it comes back to the fact that you need a certain amount of labeling in order that people can know what they're dealing with. As long as you're dealing with intelligent persons who can see a totality, they can go beyond the label and see the individual factors. No matter what happens we get down to the functioning of the individual. We don't deal with the eye, we deal with the total person and his psycho-social problems as a part of it, even as a part of the total of this action which had to do with the behavioral assessment and possible methods for improvement. So we've seen some of the notes that some of the groups discussed in terms of something other than ophthalmic measurement.

I hope that my recorders who have done so well will forgive me for not doing better in summarizing what I have brought. The one thing that I got out of it was a balance in the groups where not everybody went towards rehabilitation and not everyone went towards education of children. These both got in again and again and came back with the differences between the totally blind person and the low vision person with a need to recognize the differences. There was a very strong underlying of the proposition that the psycho-social problems of the low vision person may be more complicated than those of the totally blind person. It does not say that they may be worse but they may be more complicated. I think it is important that we see this. I don't mean I'm beginning to see it here but the group has begun to see this and has brought it together in this way. I would say it does not appear in any recorded notes that I have but in the non-recorded notes and any informal communication that has come back it would appear that the speaker who claimed to be confusing and provoking perhaps made his most quoted remark when he said, "Low vision training, nuts!"

SUMMARY OF GROUP DISCUSSIONS

VISUAL PERCEPTION AS IT RELATES TO LOW VISION

Newell C. Kephart

I think one or two generalizations developed out of the discussions. Number One, I think we tend to agree that what we do in the area of visual training or of perceptual training is not to alter the basic sensory data. I don't think we improve the visual in-put. I think what we do is to teach the individual to take a minimum of visual data and parlay it into a maximum of useable information. I believe we were in considerable agreement that this is the nature of perceptual training and also the purpose of perceptual training. We probably cannot prove that this is what we do anymore than we can prove that we do not alter the in-put information itself, but I do believe that this is probably an important hypothesis for us to proceed upon.

The second point which I thought was fairly generally expressed was that when we deal with vision in the context of rehabilitation, we are not dealing with vision alone. We are dealing with the complex of in-put information which means the other sensory avenues as well as vision. What we do in vision influences what happens in other sensory areas. We are also dealing with the central processing of data and if the recent work of Penfield and others in Neurology is true and if the speculations of Habin, the psychological group, are at all valid, this is probably true in a much more concrete way than we have formerly been discussing. It is probably rather direct influence on central processing of all kinds of data. We are also dealing with the behavior of the individual, the out-put, which is based upon the in-put. Therefore, we should think, not in terms of the visual functions alone, but also in terms of the overall pattern of in-put and processing procedures.

I think I'll throw in something here that goes a little bit beyond the title Summary. There was discussion of the residual vision problem in which it appears that this problem is not only subtractive. Not only do you remove a certain quantity of in-put information, but by the removal of that information you disrupt the organization between all of the sensory data. If the recent work on intersensory integration is correct, this is a valid hypothesis. It seems to me that if this is true, it says two things. It says number one, that in rehabilitation, we have to be careful not only in terms of what we do directly but what we do indirectly. How do we resolve these confusions and conversely, show that what we do doesn't add to the intersensory confusion instead of reducing it. Secondly, I think it says that for the patient at least, rehabilitation in this area moves from the category of a luxury to the category of a necessity. If the effect of low vision is only subtraction, rehabilitation can be a luxury. It's a nice thing to have. The patient walks down the hall with greater confidence and he looks better and so on and this is all nice. But if the effect of low vision is to confuse other modalities, to confuse the processing data, then rehabilitation becomes a necessity because this confusion is interfering with the individual's total adjustment to his environment. It throws the problem into another category.

SUMMARY OF GROUP DISCUSSIONS

TRAINING METHODS FOR INCREASING VISUAL EFFECTIVENESS

Rosemary O'Brien

As I visited the discussion groups, I kept hearing this concern about the extension of the learning that was going on in formal activities like those presented in the lessons. In two cases, I remember expounding on the fact that when the teacher starts a program of vision stimulation in our set-up, we simply don't do it unless you can give that child three times a week, forty-five minutes to an hour. Half of the time to be spent with the lesson and the other half or some proportion thereof in the environment making application of what's happened in the lesson. Whether he's locating geometric shapes in the environment or getting involved in some other activities, looking for colors, doing whatever was presented or done with the lesson. Also all the people on the team which would include the classroom teacher, the P.E. people, the mobility instructor and the parent are urged to support and expand what we are doing if possible.

One group felt that a distinction should be made between training to maximize the use of present vision and perceptual training to increase quality, consistency and accuracy of visual information. All seemed to agree on the need for functional assessment of distant visual abilities. Perhaps the Palo Alto effort has been the most realistic in that direction. Assessment should include several measures of distance and illumination for each item on the profile if it's set up on a profile format. Terms need to be defined and standardized and even piecemeal efforts disseminated. Videotapes made of meaningful adaptations and developments circulated between agencies might be one way of doing that. The need for precise definition and assessment of visual ability was stressed.

One group did list several areas of visual ability and measurement needs in research:

1. Acuity

2. Peripheral vision

3. Color

4. Motility

5. Binocularity

The need for task analysis of different kinds of seeing was repeated in several cases. We need to study perceptual development both in normal children and as it relates to disorders in adults.

It was recommended that the assessment team should involve the orientation and mobility specialists, the medical consultant and educators. The person in charge of what happens in the training program should be the person working most closely with the client, patient or student, and could be either of the three professionals depending on the situation.

The aim of vision stimulation is not to improve the acuity but efficiency of the total visual perceptual system. The Palo Alto training idea should be utilized as widely as possible and feedback shared within agencies.

Some suggestions from the Palo Alto VA Hospital group were in tracking targets through a maze and in the open varying the distance, speed, illumination, color; tracking of the targets while standing still, with the target moving; tracking with the target moving and the person standing still; and then tracking with both the person and the target in motion. All the factors could be varied.

Some of the problems are: measurement of the area of successful discrimination; maximization of the use of peripheral vision; definition of cues that trigger attention in low vision cases; identification and adaptation of present near vision assessment techniques which may be applicable to distance vision; assessment of perception of motion; and trial of all new efforts in a lab situation first before disseminating for general use in mobility.

APPENDIX A: SELECTED PAPERS

A PROPOSED METHOD OF INCREASING THE EFFICIENCY OF DISTANCE VISION OF LOW VISION PERSONS

Bruce B. Blasch*
Robert O. La Duke **

In rehabilitation, as well as in education, the definition of legal blindness in terms of standard distance acuity measurements has led to a situation where the diagnosis has had more significance than the individual's functional vision. This procedure has emphasized only the remaining senses when dealing with the problems of low vision individuals. Even though the vast majority of persons considered legally blind have useful vision, they have received services which are essentially those which were developed for totally blind persons. It is becoming increasingly clear that the problems facing the legally blind person with partial vision are extremely complex, and in fact, may necessitate a completely different method of rehabilitation and/or education than that generally employed today. In most cases, partially sighted persons continue to rely on their vision even when it has diminished beyond the point where it can be measured. At the present time, there are no reliable tests which enable us to measure the individual's functional visual ability and thereby assist rehabilitation workers in developing meaningful methods of education and training for the partially sighted. Furthermore, there have been few, if any organized attempts to train the individual to use his distance vision more effectively, other than with the use of optical aids, for independent travel.

It is becoming more and more evident that considerations must be given to functional vision. Therefore, some ideas have been incorporated into this paper in regards to a possible method which could be used in the training of low vision.

The problems involved in the rehabilitation and education of individuals with some remaining vision have received a great deal of attention recently. Articles by Graham (1964),

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who indicated that 90 percent of the blind population have useful vision, and by Blasch and Apple (1967), who stated that rehabilitation of severely visually impaired persons should be to the level of their impairment, point to the need for an emphasis on the performance of a blind person as it relates to his visual efficiency. Hoover (1964) emphasized the fact that our standard method of determining legal blindness is antiquated, inadequate, unrealistic and prejudicial. He points out that only two of several visual characteristics are considered at present. These are distance visual acuity and central fields. Even these two are not really standardized because of the lack of uniformity of distances, light, contrast, charts, and targets found in each testing situation.

At this time, the legal definition is accepted, in many instances, as a restriction on individuals who can function with far superior efficiency than their counterparts with exactly the same visual acuity.

Most of the interest in problems of persons with partial sight has centered around children. Increased activity in this area has been seen in recent writing and reviews of research activities by Ashcroft (1963). Jones (1961) and Nolan (1963) found that over 60 percent of the legally blind students registered at the American Printing House for the Blind, for the provision of educational materials, have remaining vision in excess of light perception.

Barraga (1964) demonstrated that it was possible to increase the visual efficiency of students without any significant change in the near vision recordings.

Research relating to partially sighted adults and increased visual efficiency is very meager. A great deal of research has been attempted during the last three years with optical aids (AAWB 1964, 1965, 1966). However, research related to training the individual with a series of specific adaptations in order to augment the original perceptual system cannot be found in the area of the blind.

Leibowitz (1965) stated that "it does not seem unreasonable to assume that one of the goals and purposes of perception is to

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*The authors would like to express their appreciation to Miss Ruth Kaarlela and Mr. Donald Blasch for the stimulation and crystallization of these thoughts.

stabilize our awareness of the world about us in the interest of successful adjustment". He bases this theory on the idea that as we move about in the world, optical images of the objects we look at are focused on the mass of sensory cells known as the retina. These images are formed according to known laws of optics.

When an object moves away from us, the image becomes smaller; when illumination is varied, the intensity of light in the retinal image changes accordingly; and when an object is tilted, its physical image is progressively flattened. Yet when we function in everyday settings, we do not observe the changes which take place. People appear to be about the same size as the distance from us becomes greater, despite the change in the size of the retinal image. Likewise, changes in the intensity of light falling on objects are numerous as we move about our environment; yet our perception is not predictable from the physics of the situation and does not depend upon the amount of luminous energy reflected from objects.

Another related phenomenon is that of color constancy. Although individuals are not usually conscious of it, the color of illumination changes significantly during the day, being redder at daybreak and at twilight and bluer during midday. Indoor illumination is generally redder than that illumination produced by the sun. Generally, the difference goes unnoticed.

Another important indication of the tendency to stabilize perception is the constancy of shape. If a square object is tilted at successively more acute angles, the retinal image will be distorted. Yet, these distortions are not noticed, nor is there an awareness that shapes such as the top of a glass will be imaged as ellipses or flattened arches on the retina when viewed at an angle.

The perceptual constancies mentioned above do assist us in reacting to the stable physical characteristics of objects which of course is vitally important in an individual's adjustment to the environment. Beyond this point, these perceptual constancies indicate that the perceptual process is not a passive affair but certainly demonstrate that the organism itself contributes to the process of perception. If we were to attempt to predict perception with only a knowledge of optics, the results would be very inaccurate.

Many experiments have been attempted to prove or disprove that subject performing in displaced visual fields can learn perceptually stable vision, much as the child develops a consistent perceptual orientation to his environment during the first few years of life. Generally, the question has been whether the learning process would lead to reorientation and stabilization of the displaced world.

The English psychologist Stratton (1896) devised a variety of optical devices for displaying and inverting the retinal image. In this first experiment he related many interesting observations. Initially, Stratton stated, "Although all these images were clear and definite, they did not at first seem to be real things, like the things we saw in normal vision, but they seemed to be misplaced, full of illusory images between the observer and the objects or things themselves, for the memory and images brought over from normal vision still continue to be the standard and criterion of reality."

In Stratton's second study (1897) he wore glasses for 87 hours over a period of eight days. Initially, as before, all but the simplest movements were fatiguing and he often used the wrong hand when reaching for something. Stratton also stated that relief was sometimes sought by not considering the actual visual data, and by depending solely on tactual or motor perceptions and on the older visual representations. By the seventh day, movements in the wrong direction or using the wrong hand were rare. Although it did not happen, Stratton felt that eventually the image would have been inverted via some function of the brain, and complete adaption would take place. Later studies by Ewert (1930, 1936, 1937), who repeated Stratton's experiments, led to the conclusion that Stratton had exaggerated the amount of adaption that had occurred.

Probably the most extensive recent experiments were carried on by Kohler (1951, 1953). Kohler had optical devices which were used for inversion, reversal and angular displacement of the field of vision. His work was based on the assumption that experimental displacement would return the adult to the condition of incomplete perceptual development as found in the infant.

Kohler concluded that sense organs are not rigid mechanisms but living and variable systems, the functioning of which is itself subject of variation. If a sensory system is exposed to a new and prolonged stimulus situation that departs from the one normally experienced, the system can be expected to undergo a fundamental change in its normal mode of operation. Smith and Smith (1962) indicated that although Kohler assumed that the subjects would eventually adapt completely to experimental displacement, his own reports indicated that adaptation to reversal was not complete even up to 37 days and that adaptation to inversion was not complete up to 10 days.

Snyder and Pronko (1952) with Snyder wearing their experimental glasses for 30 days summarized their findings by stressing the fact that learning did not occur with all tasks after the initial disruptive influence of visual distortion. They speculated that perception does not occur at birth but comes into being only as a result of a series of contact between the organism and features of his environment. Snyder and Snyder (1955) conducted a follow-up to the above experiments two years later and found that there was near perfect retention of the levels of performances which had been achieved at the end of the original period of displacement.

The results of these experiments are difficult to assess, but it is clear that some adaptation does occur in humans to all of the displacements mentioned in the above experiments. It does not seem feasible to infer that these adaptations can be compared to the learning which occurs in children. Complete adaptation was impossible under most conditions except to most minor angular displacements. The fact that there was a nearly perfect retention of levels of performances after a period of intervening normal vision indicated that practice and learning under conditions of visual displacement are relatively specific to the task situation and do not involve a new perceptual system. It is clear that the human perceptual system is very flexible and able to adapt in some degree to new conditions and that learning is a factor in the adaptations.

Regardless of one's theoretical point of view, these studies do show that an individual can relearn visual habits and this fact is vitally important to the partially-sighted person.

The experiments by Kohler also indicated some of the conditions under which perceptual adaptation can take place. He stated that subjects who wore the inverting glasses would continue to see the world as upside down if they sat passively looking about. He believed with sufficient movement and tactual experience in the environment, the subjects world would right itself. During the early stages of adaptation objects would tend to look suddenly normal when touched. Held and Hein (1963) have also indicated that it is essential that the subject make active corrective movements in order for adaptation to displaced images to occur.

Eye movements also seem to play a part in the adaptation procedure. Gregory (1966) stated that J. Gibson found while undertaking an experiment wearing prisms to deviate the field to one side that adaptation was more marked with free inspection of the figure with eye movements than when the eyes were held still.

Leibowitz and Zeigler (1965) conducted an interesting study which may have important implications in regards to size constancy. They demonstrated that size constancy for eight year olds was indistinguishable from that of adults at near distances, but as the observation distance was increased, the children showed progressively less constancy while the adults were essentially unaffected. They felt the results of this and similar studies implied that in some way experience with or in the environment was a necessary condition for the development of the size constancy phenomenon.

Solley and Murphy (1960) stated that practice of perceptual acts, besides being reinforcing in and of itself to the extent that the final percept is clear and definite, alters the structuring of percepts through two indirect mechanisms. "First, in practicing a perceptual act the perceiver often develops a judgmental frame of reference against which he subjectively evaluates subsequent perceptual acts. Secondly, each time a percept is formed, the more often are laid down these memoric traces, which articulate with subsequent percepts."

In Gottschaldts' studies, subjects were shown a complex figure in isolation. The subjects were then requested to locate this figure, in an even more complex masking figure. It was found that as subjects had more practice with a given form, they found it more often, in different masking contexts, and more rapidly. In short, the probability of recognition increased and the latency of recognition decreased.

In the investigation of visual learning, a number of controlled and systematic studies have been done utilizing animals. One of the pioneers in this area was Austin H. Riesen. In one of his initial studies, he raised two chimpanzees in darkness up to the age of 20 months. After some initial training it was found the first visual learning was slow. Also, the first discrimination appeared to be of size, color and presumably intensity. Form discrimination was delayed and appeared only following prolonged visual experience.

In consideration of the possibility that prolonged periods of deprivation may lead to irreversible retinal anomalies, Reisen performed a study with five chimpanzees, raising them from bith to one year of age in four conditions of light deprivation. The conditions were as follows: (1) one S was raised in complete and continuous darkness, (2) two S's were given daily 90 minute periods of diffuse light, (3) one S was given equal periods of patterned light without movement in the visual field, and (4) one S was given equal periods of normal opportunity for normal vision. The behavioral effects of conditions (1) and (2) were essentially the same. Animals (3) and (4) were only slightly and temporarily handicapped in their visual performance by comparison with normally reared controls. Riesen concluded that the prompt visual learning so characteristic of the normal adult primate is thus not an innate capacity, independent of visual experience, but requires a long apprenticeship in the use of the eyes.

Also, Riesen raised fifteen kittens under conditions of alternating monocular or binocular early visual experience. Since control animals were kept in total darkness for one or two months after birth and subsequently showed rapid learning, this period of early total light deprivation seemed not to be implicated. A habit learned monocularly was not transferred to the other eye if the second eye has previously been exposed only to diffuse light. Previous monocular alternating patterned vision was found to be a sufficient antecedent condition for the transfer of a habit learned monocularly.

In a similar study (Chow and Riesen, 1955) three chimpanzees were in the following situations: (a) one eye with diffuse light stimulation and one eye with patterned light only; (b) monocular patterned-light stimulation; and (c) binocular patterned light. The results of this study agreed with those of Riesen in that a failure of immediate and complete interocular transfer of visual habits was found in chimpanzees reared with one eye exposed to patterned light and the other to diffuse light. These same results were also found in a similar experiment using cats as subjects (Riesen, Kurke and Mellinger).

Woodruff and Wickens (1951) reared 24 rats in complete darkness and 24 rats as a control in a colony with normal day and night lighting. The apparatus was a Lashley jumping box that had been modified by the placing of an elevated Y-maze at the approach to the windows. The animals were first required to make a discrimination between horizontal and vertical striations. After this discrimination, the animals learned to make a more complex form discrimination between a card of O's and a card of X's. In the first learning task, there was no significant difference between the rate of learning between the two groups. However, in the more complex discrimination the group raised in the colony learned more rapidly than did the group raised in the dark. It was concluded that as the complexity of the form increases, the role of learning becomes greater.

It is also interesting to note the conclusions of Arthur Siegel (1953) based on data from twenty-four ring-doves reared (8-12 weeks) without experience in visual form definition. When learning a visual motor perceptual task (modified Lashley-type jumping apparatus) the birds reared without visual form definition took significantly longer than normally reared doves.

A number of experiments (D. Forgus and J. Forgus, 1952; Gibson, Walk, Pick and Trhe, 1958; R. Forgus, 1954; R. Forgus, 1955; Thompson and Heron, 1954) investigated the effects of restricting early visual experience on the problem-solving capacity in rats and dogs. The results of these studies and conclusions were generally the same. They concluded that early visual experience improves discrimination and problem-solving ability in situations where visual cues are the primary aids to the solution of the problem. They also concluded that complex motor experience improves learning and problem-solving ability in situations where kinesthetic cues seem to be important for a solution to the problem. In other words, the relative influence of early experience on adult cognitive abilities depends largely on the relationship between the kind of early experience and the requirements of the problem task.

The results of the previous studies would support the hypothesis that distance vision in partially-sighted individuals could in fact be trained. The result of this training could be greater efficiency in the use of distance vision. Also, the experimentation in the studies involving experimental glasses and those rearing animals in different environments would suggest some methods for training distance vision.

It is the opinion of the authors, that any method to be used for training distance vision should employ some of the basic principles of operant conditioning. These principles, applied to teaching via machines by B. F. Skinner, have been successfully employed and described by others (Holland, 1966). The techniques are as follows: (1) immediate feedback, (2) behavior emitted and reinforced, (3) gradual progression of difficulty, (4) withdrawal of stimulus support, (5) control of students observing and echoic behavior, and (6) branching program (based on performance criteria).

To permit implementation of these techniques of operant conditioning, the program of visual training would be on 35mm color slides. This would allow a standard program of visual training to be displayed at a distance (10' and 20'). The screen would be divided into nine equal squares and in the center of each of these squares would be a clear light bulb (75 or 150 watt). The partially sighted individual (hereafter referred to as subject) would have a small panel with nine switches controlling each of the nine lights in the screen. In this way the subject would be able to respond to the stimulus (slide) by identifying the particular square the object is in by switching on the corresponding light for that square. The subject would receive immediate feedback for a correct or incorrect perception.

In the first phase of the program the observer would be stationary and the objects presented (slides) would be stationary. After an initial instruction period in the use of the panel of switches and in the ability to discriminate the individual lights in the screen when activated, the program would begin. The subject should progress through each of eight stages, first with the right eye and finally both eyes.

1) Color Identification. The subject would first be shown a series of slides (full size of the screen) with the colors of red, yellow and blue. These would be shown in a random order

until a criterion of five consecutive correct responses has been reached. The subject should give a verbal response and the experimenter would give a verbal reinforcement.

2) Location. The subject would be shown a series of slides using the three basic colors (red, yellow, blue) with a black background. The color will be chosen randomly and the size will diminish as previous criteria are reached. The following is an example (refer to figure 1); blue 1,2,3,4,5,6; black 7,8,9; yellow 2,3,5,6,8,9; black 1,4,7; etc: red 4,5,7,8; yellow 5,6,8,9; etc.: red 4,5,6; blue 1,5,9; etc.: blue 1,4; yellow 1,5; etc.: red 6; yellow 7; etc. Color patch size would be smaller than one of the nine sections diminishing until the subject gets five consecutive wrong answers. At this point a series of horizontal and vertical lines (presented separately) would be introduced. The initial size of the line presented would be as follows: yellow 4,5,6 horizontal; blue 2,5,8 vertical. Again, the size of the stimulus would gradually diminish on each successive presentation. As mentioned earlier, the subject would indicate location by switching on a light in the respective screen section.

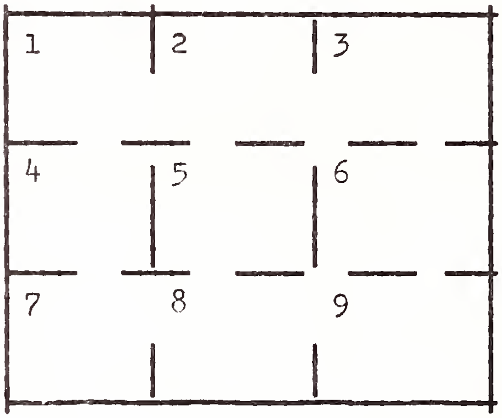

Figure 1

3) Matching. (color, intensity, size). Initially the subject would be given three color stimuli: ex. red 1, blue 2, and red 3, the subject would respond 1 and 3. Finally the

subject would be given nine color stimuli ex. red 1, yellow 2, blue 3, yellow 4, blue 5, red 6, blue 7, red 8, yellow 9, the subject would respond 1,6 and 8 for red, 3,5,7 for blue and 2,4 and 9 for yellow. Matching intensities would progress in the same manner using three intensities of each color. The final stage would be in two parts: first, all nine sections would be filled using the same color (ex. red) with three of each intensity; second, all nine sections of the same intensity with three of each color (this would be done for each intensity). The variable of horizontal and vertical may also be combined. Other dimensions that would be used are: shape (triangle, square, etc.), size (from stage 2) and various combinations of the above.

4) Ordering in Progressive Sizes. In the initial stage, the subject would be presented with two distinctly different sizes (ex. large and small square). The program would then progress to nine different size squares. At each new presentation the subject would rank them from largest to smallest (again using the light panel to indicate answer). Different shaped objects would also be used (square, triangle, etc.).

5) Likenesses and Differences. This stage would begin by comparing geometric shapes as previously mentioned with such differences as color, intensity, shape and complex forms comprised of several geometric forms together (ex. circle, square, rectangle and the second form would be different only to the extent that the rectangle had horizontal rather than vertical lines). The end of this stage would involve such discriminations as human figure with long hair and one with short hair.

6) Discriminating Missing Parts. (Complete object visible; complete object not visible) At this stage more use would be made of real life objects. Initial objects would be such things as houses without roofs, cars without fenders, bicycles without wheels, etc. More and more detail would be used such as a dog missing an ear, a chair without a leg, and a suitcase without a handle.

7) Duplicating Designs and Patterns. This stage would begin using near and distance vision. It would employ the use of some of the previous slides. While looking at a pattern of a variety of colors in a unique combination, the subject would be required

to duplicate the pattern. The subject would accomplish this by using three dimensional blocks of the same color. This stage would progress to duplicating complex designs involving a variety of geometric figures.

8) Depth Perception. (using three-dimensional objects) Large objects such as boxes, chairs, balls, etc., placed at different distances (ex. one box at 10' and one at 20'; one box at 20' and one at 25') would be the initial stage. The objects used would have to be the same size and the same shape. As the person progressed the objects would get smaller until the subject would be using model cars. At this point, the subject would be required to manipulate the objects via a string to have them the same distance from the stationary object.

Most of these eight stages have tasks that would require greater visual efficiency than obtainable by the subject. However, each subject could still progress through all eight stages, but the size and complexity of the stimulus objects would be larger for some subjects.

Another factor to be considered is that of movement. In independent travel, it is implicit that the individual must negotiate both stationary and moving objects. There are also situations where the individual must evaluate the projected path of moving objects while he himself is stationary. It is apparent from these situations that the variable of movement must be considered in a program of increasing the efficiency of distance vision in low vision individuals.

An elaboration of this variable of movement as it relates to this particular program will be discussed at a future time. However, the basic concept would involve the manipulation of the training situation. In the program described above, both the subject and the visual stimulus are stationary. Other phases of this program would involve the following situations: subject stationary and the visual stimulus moving; subject moving and the visual stimulus stationary; and finally, the subject and the visual stimulus moving. Other variables to be manipulated in the context of these situations would be color, size, speed, path, light, contrast and two or three dimensional presentation of the stimulus object or objects.

In conclusion, based on the research cited, it is our intent to submit the previously described program as a method of increasing the efficiency of distance vision in low vision individuals. Many questions are yet to be answered. Such questions are: how much practice should be given in each stage before establishing a limit of visual efficiency; how long should the individual training sessions be and how much per day spent in training; at what point should visual aids be checked for possible alterations; and what tasks could be given to the subject to practice on his own time? These and many other questions can only be answered by experimentation.

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A NEED TO KNOW

Questions arising from rehabilitation workers' search for information in visual perception research which would be useful in low vision programming

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The authors have reviewed most of the references cited in the bibliography as part of their study. They compiled the list of questions related to these references. These questions were formulated when (a) it appeared that additional knowledge was needed in the subject area covered by the reference (b) it appeared that methods were needed to apply the information cited in the reference to the assessment or training of persons with low vision.

The questions are being published here in an effort to stimulate additional research interest in the subject area. In some instances, the questions may reveal the authors' lack of intimate knowledge of a particular field. It should be pointed out, however, that the worker who is trying to make application of research data to a rehabilitation or education program faces the necessity of making sense out of highly technical materials from many disciplines. Whenever the answers to these questions are of a basic research or clinical nature, the workers are still faced with the necessity for finding a mode of application.

Some questions arise from the fact that we are dealing with phenomena which does not directly apply to techniques described in the literature. Some of these phenomena are: phosphenes, photophobia, eccentric fixation, fluctuation, extinction, illusory motion and distortion of speed or direction.

Both the bibliography and the questions are presenting a broad perspective. They do not follow any particular school of thought in any of the disciplines represented.

Characteristics of Eye Conditions Related to Low Vision

1. What percentage of low vision cases experience visual extinction frequently?

2. What are the characteristics of the eye condition that cause visual extinction?

3. Is there any change in saccadic eye movements in low vision cases?

4. What are the characteristics of suppression with incongrous hemianopsias and do these differ from congrous?

5. What are the effects of hemianopsias on pursuit movement of the eye?

6. Does retinal fatigue occur in eye conditions other than retrobulbar lesions? As described by Bender (Bender, M.D. & Teuber, H.L., "Ring Scotoma and Tubular Fields" Archives of Neur. and Psychiatry, vol. 56, 1946)

7. When a central scotoma occurs, is there a relationship between size and shape of scotoma and the formation of pseudo-fovea?

8. When a central scotoma occurs, in what part of the field do pseudo-foveas most often form?

9. When a pseudo-fovea forms, does the remainder of the visual field shift in any way to function as periphery to the new fixation point?

10. What is the relationship between visual performance and visual acuity in a longitudinal study of persons with deteriorating vision?

11. How can dark adaptation be measured? How can the ability to discriminate brightness-difference be tested under conditions of dark adaptation.

12. Are there more recovery stages of function of vision than those cited by Bender? (1. undifferentiated sensation of light without shape, color or orientation in space. 2. movement of a light may be distinguished from a stationery light but unable to indicate the direction or speed of movement. 3. orientation of objects in visual space when vague and "fuzzy" contours are reported. 4. Color experiences -- after a period of intense red coloration of entire field.)

13. What effects do injuries which result in impaired eye movements have on perception?

Characteristics of Eye Conditions Related to Low Vision

14. What is the relation between peripheral visual acuity under scotopic and photopic conditions including detection of brightness differences with low vision cases?

Visual Perception as it Relates to Low Vision

1. Does the suppression of visual signals utilized in normal seeing continue into low vision? Does it change to a type of suppression appropriate to low vision?

2. Is closure different for distance vision than for near vision? If so, in what ways?

3. In low vision, what is the relationship between closure and low vision memory?

4. How is completion unlearned in cases where it inhibits functioning such as in hemianopsia?

5. Is there a transfer of visual skills from normal sighted state to low vision?

6. Are spherical abberations caused by aphakic lenses suppressed by persons wearing the lenses for long periods of time?

7. What tests could be used for assessing visual thresholds (size, brightness level, brightness contrast, time) in low vision cases?

8. Is there any difference in the rate of visual reorganization in low vision cases who wore glasses before loss of sight and those who did not?

Effects of Severe Visual Impairment on Psycho-Social Behavior

1. Does the teaching of the selection of low vision cues accelerate the change in suppression?

Effects of Severe Visual Impairment on Psycho-Social Behavior

2. Is there a correlation between the "role" of self-image of the low vision person and his mobility skill?

3. What are the psycho-social characteristics of low vision adults (achievement, fatigue, emotional problems, etc.)?

4. What are the characteristic ways in which low vision cases identify themselves in self-image, interpersonal relationships and function?

5. What are the cultural stereotypes which deal with low vision persons?

6. In low vision cases, what is the relationship between public contact and fatigue?

7. Do low vision persons engage in withdrawal behavior to avoid frustrating situations?

8. What is the effect of an individual's "preferred level of activity" or "preferred level of stimulation" on his adjustment to low residual vision?

9. What is the relationship between verbal skill and social adjustment?

10. What is the relationship between verbal skill and interpreting visual performance to others and social adjustment and social acceptance of low vision cases?

11. What is the most socially acceptable manner for low vision cases to interpret their visual impairment and performance?

12. Does low vision effect the low vision individual's personality?

Training Methods and Functional Assessment

1. Does rapid scanning of an object improve discrimination when it involves distance vision?

Training Methods and Functional Assessment

2. Will the use of a half blindfold improve cane skill, visual skills and awareness of other senses more rapidly and effectively than either the blindfold or no blindfold?

3. What are the techniques which low vision cases employ to deal with extinction?

4. Would the correlation of visual input with other sensory data be enhanced by simultaneous feedback in all sensory areas relevant to mobility? (Refers to use of blindfold.)

5. What is the best method for discriminating distance and speed of objects moving perpendicular to the low vision person?

6. Is there a transfer of skill in low vision perception from one environment to another?

7. What is the role of size in the speed of discrimination of a distant object?

8. What are the most effective methods of fixation (examination of object) for various types of visual tasks (i.e. obstacle avoidance, recognition, etc.)?

9. What are the effects of anxiety, tension or abstraction in interpretation of environment in which the low vision person is mobile?

10. What effect does the role concept of a low vision person play in his interpretation of the environment in mobility?

11. What is the effect of situation on the accuracy of identification of an object by the low vision person?

12. When low vision cases have central scotomas, what are the characteristics of their unlearning to use central vision and learning to utilize peripheral vision?

13. How much time and what kinds of experiences bring about the completion of hemianopic visual fields in new hemianopsia cases?

14. What are the measurable characteristics of sighted mobility in terms of efficiency (time, accuracy, quality), ease, safety and appearance?

Training Methods and Functional Assessment

15. What are the characteristics of learning correct speed estimation for hemianopsia vision and for various types of fields?

16. When central scotoma occurs, under what conditions do pseudo-foveas form?

17. When central scotoma occurs and pseudo-foveas do not form, what are the characteristic uses of vision?

18. Is it possible to develop pseudo-foveas through training?

19. Can low vision cases be trained to determine color by shadings?

20. What is the most effective method for providing feedback about their environment to low vision cases?

21. What methods of reinforcement are most effective in stabilizing consistent accurate judgments?

22. What distinctive features are most useful in discriminating for identity?

23. What general principles will transfer in perceptual training for low vision cases?

24. What sort of cues trigger attention in low vision cases?

25. Has F.N. Low's work with training peripheral vision been replicated with measurement of concurrent benefits for distance vision?

26. What are the developmental levels of low vision training?

27. What is the relationship between judgment of distance and retinal damage resulting in field loss?

28. Can low vision cases be trained to walk with the aid of telescopic lenses?

29. What are the effects of telescopic lenses on the orientation of the wearer, on spatial relationships and perception of subject's motion in relation to motion of others?

Training Methods and Functional Assessment

30. What is the hierarchy of discrimination (visual perception) for brightness, color, form, etc.?

31. What is the hierarchy of visual perception of each within each of these components (color, form, brightness)?

32. What are the effects of sun angle on distance vision outdoors?

33. What is the relationship between rapid extinction and functioning in mobility?

34. What cues do low vision persons select for the identification of an object?

35. What visual cues do low vision cases select to identify moving objects and determine their course, speed and distance?

36. Does the time involved in identification of a moving object differ from time involved in identification of a stationary object?

37. What is the hierarchy for evaluating perceptual judgment as it relates to functional aspects of low vision? (upper and lower thresholds, spatial judgments, 2-D judgments, size, angle, depth, distance, speed, form.)

38. What are the effects of field defects on the ability of the eye to pursue moving objects?

39. What is the time necessary for the presentation of a moving object to develop pursuit in the eye if there is central scotoma or if there is peripheral field loss?

40. Does the development of pursuit in the eye take longer for extra-foveal parts of the retina than others?

41. How similar are subjective and objective visual fields when the finest measurements are taken for both?

42. What types of field defects are most easily perceived in subjective field examination?

Training Methods and Functional Assessment

43. What are some subjective field examinations which could be administered by Mobility Specialists?

44. What methods are applicable for the location of pseudo-foveas?

45. What is the level of awareness of superior and inferior field defects in Mobility?

46. What is the effect of brief visual disfunctioning on account of problems with adaptation and accommodation on low vision cases, heart rate and level of tension?

47. How do you measure distance perception under conditions of dark adaptation?

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A WORKING PAPER ON PSYCHO-SOCIAL RESPONSES TO LOW RESIDUAL VISION

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The following is a working paper describing observable characteristics of seriously visually impaired low residual vision (l.r.v.) individuals as observed at the Western Blind Rehabilitation Center (WBRC) during a three-year period. The statements should be viewed as propositions for testing and less as assertions based upon verifiable data. Where possible, indicators of variables are explicitly stated. Finally, the statements are exploratory in nature and thus are presented for the purpose of raising questions rather than for the purpose of presenting proof about the behavior described.

The characteristics of l.r.v. which will be described relate to the following: cultural values, family, occupation, role learning, organismic involvement, through processes, personality, dependency, annoyances, self-rejection, insecurity and adaptation.

SIGHT LOSS AND PERCEPTION OF CHANGING ROLES

Two types of relationships are relevant in understanding the personal and social adjustment of the low residual vision individual: A - the relationship between the individual and physical stimuli; B - the relationship between the individual and other individuals in the enactment of social patterns or social roles. Prior to loss of sight the individual learned characteristic modes of adaptation to physical stimuli and social patterns. At the onset of sight loss readaptation in both areas becomes necessary. Individuals have large numbers of these relationships and are continuously establishing new ones or revising old ones. The content of the interaction between the individual and physical stimuli and social patterns becomes dysfunctional when l.r.v. occurs and like his perceptions of the form of the physical stimuli, both the individual's self reactions and responses of others in the social pattern tend to change as a result of the change in visual acuity that he has experienced.

Thus, a different ordering of the man-social pattern relationship is required. When the l.r.v. individual perceives the social pattern in terms of a previous learned conception, inaccuracies in the reciprocal responses of others occur. Cultural values in our society dictate that serious loss of sight necessarily has a corresponding loss of functioning in social relations. Because the position of the l.r.v. individual characteristically changes downward in the hierarchy of positions in the structure, there is often a corresponding adaptive change in the roles of others in the structure. The process of readaptation of persons in the patterned relationships consists of the modification of expectations, but since there tends to be a relative absence of knowledge by individuals about adaptation to l.r.v., adaptation tends to be random and on a trial and error basis. Modifications do occur in role behavior, but since they are largely on a trial and error basis, maladaptive behavior by the l.r.v. individual increases, tensions become greater, and frustrations accummulate. For example, l.r.v. individuals experience a change in their role of importance in the family, on the job and in the neighborhood. Responsibilities tend to be shifted to the older son or daughter or are assumed by the spouse. The individual's knowledge about family matters, especially in the financial area, tends to decrease as his role in decisions decreases. If he continues in his former work, serious misunderstandings, blame, breakdown in communications, feeling of being watched, loss of promotional opportunity, etc. add to feelings of insecurity and loss of status occurring at home. His perceptions of himself and perceptions of others may become unstructured for a time, however, restructuring often occurs in faulty and erroneous ways which resemble delusional patterns found in the typical paranoid. In the family, physical conflict with the children as well as the spouse may occur due to frustration and extreme insecurity, all of which reacts back upon the individual's decreasingly effective role as a significant person in the family. Job insecurity and decline in confidence among fellow workers and by the employer further adds to the vicious cycle of loss of functioning, insecurity and anxiety, further loss of functioning in important roles, lack of structure in relationships with others, distorted perceptions, additional insecurity and anxiety, etc. Permitted to continue, the experience may easily deteriorate into extreme personal and social problems. It is not so much that disorganized behavior occurs but rather the patterns of relationships become unorganized or in time disorganized when the discord and conflict take shape as consistent modes of interaction.

Lack of congruence in the organization of social roles has consequences for the direction of personality change. For example, another characteristic of persons with l.r.v. is a tendency towards symptoms of depression. A decrease of sense of adequacy in the family and on the job adds to the feeling of loss occurring with decrease in vision. In addition, the individual becomes less physically active and more sedentary. The decrease in physical activity, absence of new experiences, and loss of status often results in unaccustomed depressions. On the other hand, when the restructuring of relationships occurs in terms of guided learning, adequate models, opportunity for learning in terms of contemporary knowledge and techniques, repetition, reinforcement and practice of the knowledge and techniques, the chances for success in change in role behavior is greatly increased.

SIGHT LOSS AND ROLE LEARNING

When l.r.v. occurs, the individual finds that activities which were formerly casual and automatic now involve more concentration, time and effort. For example, dialing a phone, completing a purchase at a supermarket, purchasing a ticket at a movie, managing his personal effects, selecting clothing, shaving, etc. There tends to be considerably more involvement of body systems in controlling himself in relation to objects, events, activities and situations. Ordinarily, most of an individual's daily functioning in these areas is organized in ways that require minimal affective, motoric, autonomic, glandular, etc. body systems. There tends to be minimal connections between the activities and the self. Oftentimes, the individual performs these public or private activities while simultaneously imagining himself in totally different situations through daydreaming or fantasying. When a disproportionate amount of daily functioning is directed in terms of intensive organismic involvement, there are consequences upon the expenditure of physical energy, level of stress and body tension. There may also be consequences upon learning of new social roles, personality formation and role enactment.

The l.r.v. individual experiences problems in role learning. This may result from the inaccessibility of his own behavior to himself due to intensive organismic involvement. Accessibility refers to the reportability of role enactment or the extent to which the individual's role behavior is available to his own self-reactions. This carries the connotation that the individual cannot make valid observations of his own role enactments under some conditions. For example, when traveling in a busy downtown business section, the individual's organismic involvement is relatively more intensive when avoiding danger, in identifying formerly familiar objects, in identifying landmarks and in maintaining orientation. Thus, in being greatly involved in the organismic features of the role enactment, probability of reflecting upon himself as a social object who is performing in an activity is greatly limited.

The l.r.v. individual's ability to engage in hypothesis testing or "as if" behavior is decreased when sight loss occurs. "As if" behavior refers to the ability to treat an object or event "as if" it is something else and to hold the conception in mind while attempting to group apparently disparate objects or events into a common concept. The person must hold the thought or maintain the set established by the problematic event while at the same time considering the independent object or event. The learning of new social roles, the maintenance of stability and personality as well as meaningful personality change are seriously retarded when the individual is unable to respond to himself as a social object. Similarly, the ability to engage in "as if" behavior as other abilities is probably greatly reduced when the individual experiences stress and anxiety. It may be that relaxation training is important as a corrective technique to provide the conditions for "as if" behavior.

SIGHT LOSS, PERSONALITY AND ROLE ENACTMENT

In this section, it is hypothesized that three l.r.v. personality types tend to develop. These should be viewed as ideal types as actual individuals correspond only to a degree. First, the type characterized by the individual who uses the blind aspect of his identification to gain "the edge" or the advantage in most of his daily activities; second, the type characterized by the individual who tends to identify himself as a sighted person and who attempts to "pass" as a sighted person by completely rejecting blindness; third, the type characterized by the individual who attempts to learn the maximum use of residual vision as it applies to his total life situation. In learning his limitations and powers of functioning, he attempts to make a valid assessment of when to use the technique-ways of the blind as a sensible adaptation to fulfill his needs.

The l.r.v. individual often tends to control social situations by using characteristics of total blindness. Though often interpreted as "shamming" or "faking" by the public and other blind persons, it tends to occur more frequently among those who withhold information about their amount of vision and less frequently among those who feel their vision is improving. It is also related to the phenomenon of " having the edge" frequently observed among l.r.v. individuals. Basically it may reflect an initial uncertainty about how to behave, which in time becomes resolved by the expediency of appearing to be totally blind. This adaptation may eventually become part of the individual's habit system which is called forth whenever the constellation of related situational stimuli requires. A set of social rewards and penalties accompany the tendency to control situations by "shamming". Rewards take the form of praise from unsuspecting sighted persons who define him as "an unusual blind person". Penalties take the form of a deprivation of rewards for real and valid accomplishments from persons who know his true identity, usually family, friends and other disabled individuals by attributing his accomplishments to remaining visual acuity.

Related to the foregoing, l.r.v. individuals tend to have a conception of themselves as being a separate group of disabled persons. The self-conception is probably related to the feeling of being "in between" the totally blind and the sighted. Sometimes described by Stonequist's concept "marginal man" it causes the individual to raise questions about "who am I" and questions from others about "who is he?"

When the subject of low residual vision is raised, some individuals experience a strain to maintain their identifications as different from the totally blind. Lacking an adequate language to communicate the differences, there also tends to be an increase in level of anxiety, body tension, movement and heightening of awareness. A partial explanation for viewing himself as different from either the totally blind or the sighted may be that he tends to draw upon sighted models in the shaping of his behavior. In addition, relationships with sighted persons are a fragile dimension of his adaptation because they are the areas in which he is most uncertain and since he in fact does have a serious visual problem, sighted persons are also uncertain about his limitations. He is unable to "pass" successfully but aspires to do so. Sighted persons, in turn, may actually positively reinforce his aspirations to act as a sighted person in some instances, but withhold reinforcement in other areas of role enactment.

The foregoing raises several questions for exploratory research. One, does the adventitiously l.r.v. individual identify with the normally sighted population to a greater extent than the congenitally l.r.v. individual and the adventitiously totally blind individual? To investigate this question, however, one needs to ask: Two, what are the roles and tasks in which the adventitious l.r.v. and the congenital l.r.v. individuals most frequently engage when functioning as totally blind persons and as sighted persons? Three, is the adventitious l.r.v. individual more successful in role performance and in tasks when functioning "as if" he is a sighted person than is the congenital l.r.v. individual, i.e. is he able to pass more successfully as a sighted person in roles and tasks than is the congenital l.r.v. individual in the same roles and tasks? Four, are the consequences of such identifications different for the three populations with respect to the following: a. rehabilitation training, i.e. travel training, writing skills, personal management skills, and manual skills. b. relations with others during training, i.e. relations with staff, relations with fellow students, demands upon staff. c. amount of dissatisfaction during rehabilitation training, i.e. with food, with medical care, with scheduling of time. d. cooperation in the rehabilitation program. e. family problems arising during the program. f. tensions, anxieties and emotional stability during the program. Five, what are the roles and tasks in which the adventitious l.r.v., the congenital l.r.v. and the total adventitiously blind individual identify as sighted persons? Six, what factors differentiate among the adventitious l.r.v., the congenital l.r.v. and the adventitious totally blind who do identify as sighted persons as compared to those who identify with totally blind persons, i.e. participate in role performance and tasks as totally blind and not as l.r.v. individuals or sighted persons. Seven, do the adventitious l.r.v., the congenital l.r.v. and the adventitious totally blind differ in terms of the following: saliency of visual memories, fear or concern about total sight loss, tolerance of annoyances, i.e. not being able to drive a car, use of a cane, being identified as a blind person, responses of pity from the public, being talked about as if not present, having questions answered, lack of understanding, loud noises and crowds are some examples of this characteristic self-rejection, suspicion, expressed feelings of economic insecurity. Eight, do low residual vision individuals have concerns about their own personality? Are they concerned about characteristic modes of responses manifested by them as sighted persons and their consequences in future situations as disabled individuals? Does the greatest concern relate to those personality attributes which function unsuccessfully when sighted? Does he wonder about how he will handle those situations as a low vision person? Does not knowing "how to be" or "how to relate" to others produce additional personal insecurity? Does he require opportunity to talk about the situation areas and to work through his part of the interaction so as to improve his understanding? Does he need to develop additional self-constructs and other alternative ways of perceiving himself so as to increase his repertory of interpersonal skills?

As stated, the above observations are based upon clinical interviews of individuals with l.r.v. Upon loss of sight and in a great many of his trial and error experiences, the l.r.v. individual finds that many of his previous casual involvements are no longer automatic. A great deal of effort in role behavior is involved in quite ordinary tasks and activities with negative consequences for new role learning. To understand the effect of l.r.v. upon the accessibility dimension and the "as if" dimension one needs to consider that prior role expectations in the family, on the job and in the community become modified in relatively unpredictable and poorly defined ways in the l.r.v. population. At times he persists in responding to others in ways that are no longer relevant or the others continue in their role expectations unmindful that new role behavior is being learned by him. Or, as noted above, the individual is often times so much involved in adaptations to matters of personal management and personal care that experiences involving reflections upon himself become fewer and fewer. It needs to be remembered that both the accessibility dimension and the "as if" dimension involve the use of symbols or language. If the individual's life roles are relatively unstructured it may also follow that important connections between meanings, symbols, objects and events will also be seriously impaired. As in the need to re-establish modes of identification with physical objects and physical events to move about with improved effectiveness, so too it is necessary to re-establish modes of identification with social patterns, significant others and with oneself. Re-establishing a self identity requires the use of symbols with which to hold in mind the problematic element of his self-concept while working through his adaptations. It may be that there is an absence of an adequate language in this population just as there seems to be an absence of an adequate language to communicate the sensory responses in object perception among the congenitally blind. During interviews, many l.r.v. individuals comment upon the lack of understanding of their problems by others. A frequently heard complaint is that neighbors, friends and acquaintances have often asked a wife or parent "why so and so passed them without acknowledging a greeting?" The l.r.v. individual usually pleads "how can I explain when I can see and when I cannot? I don't remember what the day was like, cloudy, rainy, whether I was indoors or outdoors." Loss of hearing can be explained by the term, "I am hard of hearing." There is no similar expression for the person with serious visual impairment. The development of skill in the communication of his experiences to family members and the development of a language to facilitate communication would appear to be vital for this sub-population.

Finally, it is important to gather additional knowledge about the cultural definition of sight loss both cross-culturally and from the sub-groups within the society. Cultural values influence the perspective from which others view the remaining capabilities of the l.r.v. individual. They also influence the view which the individual himself has about his future development. For example, in Spanish-American or Mexican-American ethnic groups the values implicit in the concept of "Machismo" interact upon the view that the male takes of himself as the leader of the family, as the masculine symbol and the authoritative figure.

Total or partial loss of sight chips away at his former position and is substituted by a dependent role. Similarly, other cultural values influence the view of ethnic groups such as the American-Indian, Chinese-American and Japanese-American. In this regard, it was proposed that following the onset of sight loss, some of the learning experiences for the l.r.v. individual are on a trial and error basis, at which times there tends to be an excess of definitions of behavior based on social roles derived from an archiac, largely invalid, traditional conception of the abilities of the blind. Other learning experiences tend to occur in terms of influences conceptualized as guided trial and error. In these there is an excess of definitions of the abilities of the blind which are based upon social roles derived from contemporary valid knowledge regarding human potentiality of visual, tactual and olfactory perception. In this conception, it is assumed that in addition to variations in individual capacity, differential role experiences in terms of an excess of associations with the traditional view or contemporary view or combinations thereof, in large measure contribute to the observable differences in the population of l.r.v. individuals. Since the individual develops in the context of social and cultural values regarding disabilities, he brings into his new condition of low-residual vision knowledge which reflects these values. A grasp of these culturally defined assumptions may add important information to the evaluation of an individual's motivation, plans for the future, family setting and community acceptance, all of which may be counter-influences upon the attitude change, behavior change and personal change occurring in the community or at a center for the rehabilitation of the severely visually impaired.

APPENDIX B

AGENDA

LOW VISION CONFERENCE

"VISUAL ABILITY: ITS BEHAVIORAL ASSESSMENT AND POSSIBLE METHODS FOR IMPROVEMENT IN THE INDIVIDUAL WITH SEVERE VISUAL IMPAIRMENT"

Sheraton Palace Hotel - San Francisco, California
November 29 - December 1, 1970

Sponsored by U. S. Office of Education

Sunday, Nov. 29, 1970

2:00 - 2:45 Sierra Room	Introduction and Opening Remarks Background of Conference L.E. Apple, Chief, Western Blind Rehabilitation Center, Palo Alto, Calif.
2:45 - 3:15	I. "Characteristics of eye conditions related to low vision" Chairman: Richard E. Hoover, M.D. Vice Chief of Staff, Greater Baltimore Medical Center
3:15 - 4:45	Group Discussions Grp A - Sierra Rm Chairman: R.E. Hoover Recorder: Marianne Apple Grp B - Rm C Chairman: A.C. Heinsen, Jr. Recorder: R. Friedman Grp C - Rm D Chairman: E. Mehr Recorder: A. Jampolsky Grp D - Rm G Chairman: J. Sachs Recorder: L. Riley
4:45 - 6:45	Dinner
6:45 - 7:15 Sierra Room	II. "Measurement of visual effectiveness" David L. Knox, M.D. Assoc. Prof. Ophthalmology, Johns Hopkins School of Medicine, Baltimore, Maryland
7:30 - 9:00	Group Discussions Grp A - Sierra Rm Chairman: C.B. Margach Recorder: D. Perry Grp B - Rm C Chairman: A.C. Heinsen, Jr. Recorder: Margaret Hoag Grp C - Rm D Chairman: A. Jampolsky Recorder: E. Mehr Grp D - Rm G Chairman: L. Riley Recorder: J. Sachs

Monday, Nov. 30, 1970

9:30 - 10:00 Sierra Room	III. "Effects of severe visual impairment on psycho-social behavior" Chairman: Rev. Thomas J. Carroll, Exec. Director, Catholic Guild for All the Blind, Newton, Mass.
10:15 - 11:45	Group Discussions Grp A - Sierra Rm Chairman: D. Blasch Recorder: E. Thuis Grp B - Rm C Chairman: E. Glass Recorder: I.F. Lukoff Grp C - Rm D Chairman: R. Peabody Recorder: B. Lowenfeld Grp D - Rm G Chairman: L. Riley Recorder: C. Ault
11:45 - 1:30	Lunch
1:30 - 2:00	IV. "Functional assessment of low vision" Chairman: Charles B. Margach, O.D. College of Optometry, Pacific University
2:00 - 3:30	Group Discussions Grp A - Sierra Rm Chairman: D. Perry Recorder: T. Cornsweet Grp B - Rm C Chairman: R. Friedman Recorder: W. Kingsley Grp C - Rm D Chairman: Carol Krauss Recorder: S. Suterko Grp D - Rm G Chairman: Donald Cooper Recorder: B. Blasch
3:30 - 4:00 Sierra Room	V. "Visual perception as it relates to low vision" Chairman: Newell C. Kephart, Director Glen Haven Achievement Center, Fort Collins, Colo.
4:00 - 5:30	Group Discussions Grp A - Sierra Rm Chairman: T. Cornweeet Recorder: Carol Halliday Grp B - Rm C Chairman: Margaret Hoag Recorder: John Malmazian Grp C - Rm D Chairman: N.A. Buktenica Recorder: R. Peabody Grp D - Rm G Chairman: R. Williams Recorder: E.E. Miller
5:30 - 6:15	Chairmen meet with Group Recorders

Tuesday, Dec. 1, 1970

9:15 - 9:45 Sierra Room	VI. "Training methods for increasing visual effectiveness" Chairman: Rosemary O'Brien, Coordinator Program for the Visually Handicapped Montgomery County Public Schools Rockville, Maryland
9:45 - 11:00	Group Discussions Grp A - Sierra Rm Chairman: D. Blasch Recorder: Marianne Apple Grp B - Rm C Chairman: R. Friedman Recorder: W. Kingsley Grp C - Rm D Chairman: S. Suterko Recorder: Carol Krauss Grp D - Rm G Chairman: Kent Wardell Recorder: B. Blasch
11:00 - 11:45	Chairmen meet with Group Recorders
11:45 - 12:45	Lunch
Sierra Room	VII. Plenary Session Chairman: Georgia Lee Abel, Prof. of Spec. Educ., San Francisco State College
12:45 - 1:00	Report on Topic I - Richard E. Hoover
1:00 - 1:15	Report on Topic II - Wilfred Kingsley
1:15 - 1:30	Report on Topic III - Rev. Thomas J. Carroll
1:30 - 1:45	Report on Topic IV - Charles B. Margach
1:45 - 2:00	Report on Topic V - Newell C. Kephart
2:00 - 2:15	Report on Topic VI - Rosemary O'Brien
2:15 - 2:30	Summary and closing remarks

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RESULTS OF POST-CONFERENCE SURVEY

In an attempt to assess the value and effectiveness of the Low Vision Conference, a questionnaire was sent to the conferees. The following list represents their comments on the conference, changes in concept or interest regarding low vision and on the need for further meetings. Responses from 23 out of 35 conferees are listed in rank order, the number in paranthesis representing the number of times the comment was made. The comments listed cover critical aspects of the conference, individual personal reactions to the conference, innovation in the area of low vision as a result of conference interplay and proposed areas to be analyzed by future conferences.

1. There is a need for additional conferences on low vision. (11)
2. The problem area of low vision was well defined. (8)
3. There should be small conferences to design training techniques. (8)
4. I learned something. (7)
5. The conference speakers need to be better prepared and stick to their assigned topic. (7)
6. There should be small conferences to design evaluation procedures. (7)
7. I have an increased interest in low vision. (6)
8. The multi-disciplinary approach used in the conference was effective and stimulating. (6)
9. There should have been an opportunity for more mixing in the discussion groups. (6)
10. The conference was well organized and made good use of the conferees' time. (6)
11. The conference should have had more concrete goals. (5)
12. There is need for more useful eye information than is currently available. (5)
13. I experienced no change in my concepts. (4)
14. Semantics is a problem. (3)
15. I now understand where my own discipline fits into the picture. (3)
16. There should be conferences of low vision aids and mobility. (3)
17. There should be conferences to catalogue problems in low vision. (3)
18. There is a need for additional eye research. (3)
19. The ophthalmologists and other authority figures tended to dominate the conference. (3)
20. There is a need to change the use of the word "blindness". (2)
21. There should be a conference on eye conditions. (2)
22. There should be a conference on the implications of low vision on education, mobility and vocation. (2)
23. People admitted they didn't know or have answers to the problem. (1)
24. There should be a meeting of low vision persons. (1)
25. There should be workshops for instructing evaluation and training procedures. (1)

26. There should be a conference on the psychological factors of low vision. (1)
27. Low vision evaluation procedures (functional) should be standardized. (1)
28. No additional conferences on low vision should be held for a while. (1)
29. An advisory group to plan additional low vision conferences should be set up. (1)

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